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**Vinegar et al.**(10) **Patent No.:** **US 7,121,342 B2**(45) **Date of Patent:** **Oct. 17, 2006**(54) **THERMAL PROCESSES FOR SUBSURFACE FORMATIONS**

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See application file for complete search history.

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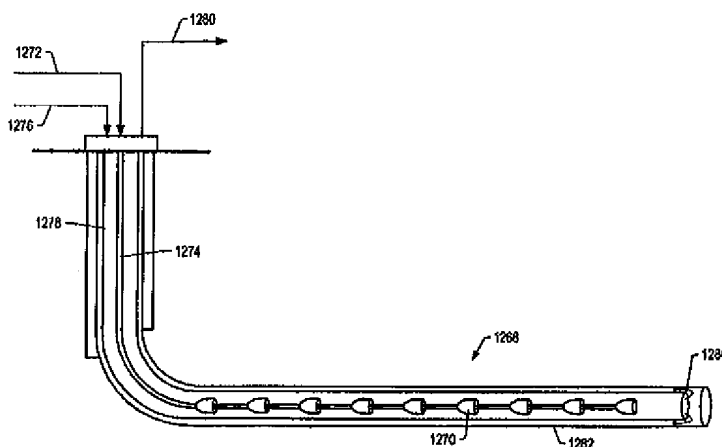
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*Primary Examiner*—George Suchfield(57) **ABSTRACT**

A process may include providing heat from one or more heaters to at least a portion of a subsurface formation. Heat may transfer from one or more heaters to a part of a formation. In some embodiments, heat from the one or more heat sources may pyrolyze at least some hydrocarbons in a part of a subsurface formation. Hydrocarbons and/or other products may be produced from a subsurface formation. Certain embodiments describe apparatus, methods, and/or processes used in treating a subsurface or hydrocarbon containing formation.

**63 Claims, 158 Drawing Sheets**

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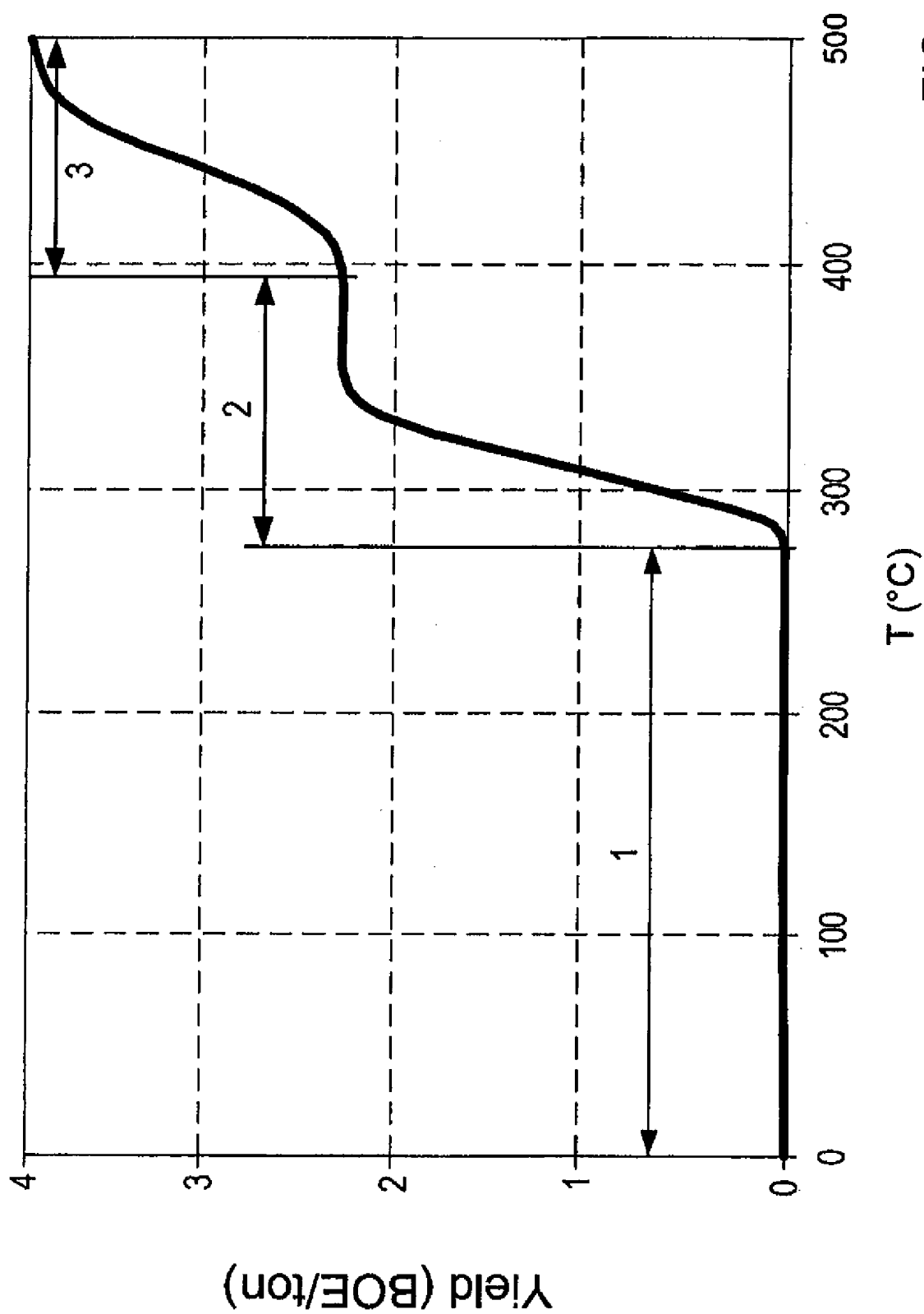


FIG. 1

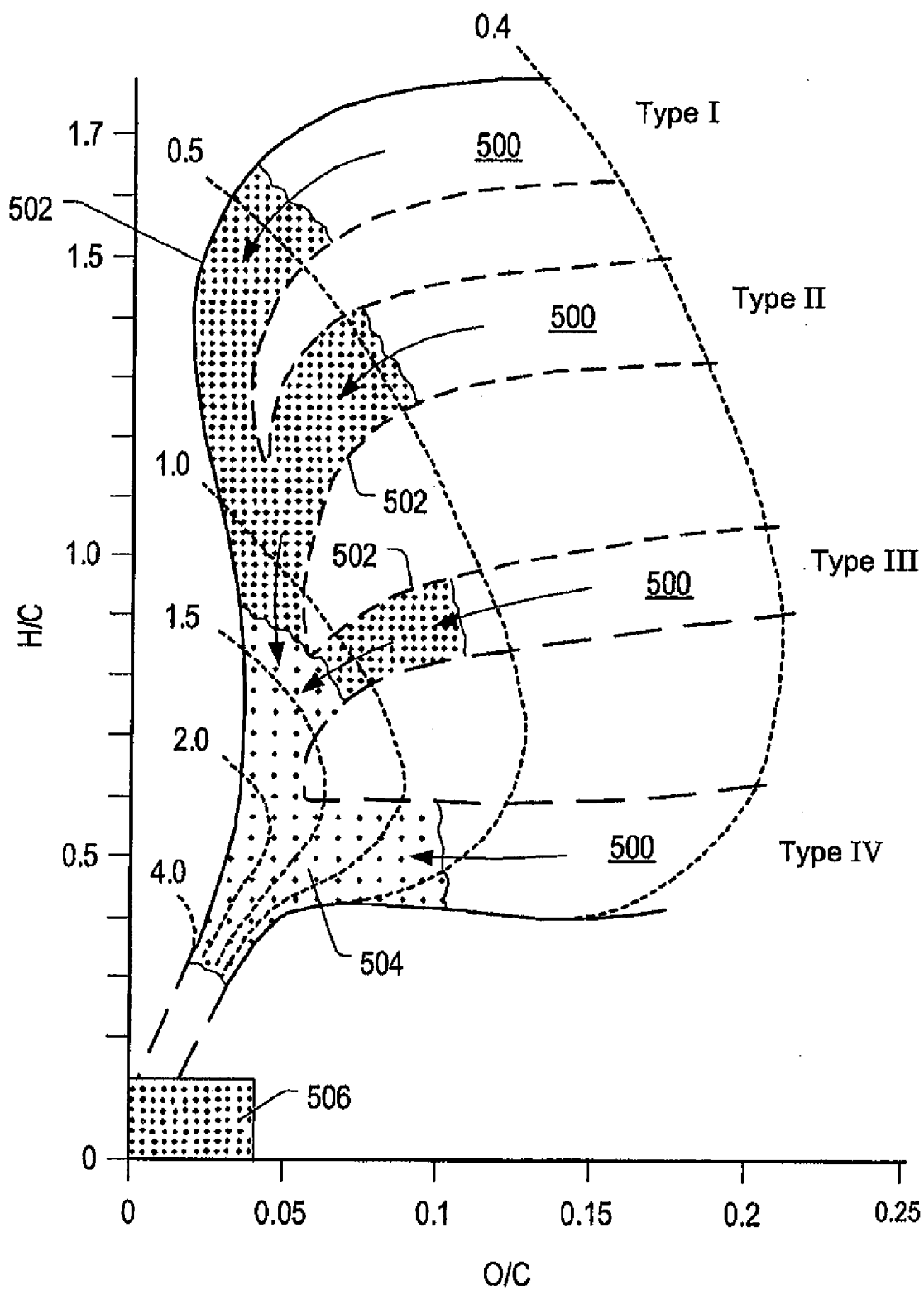
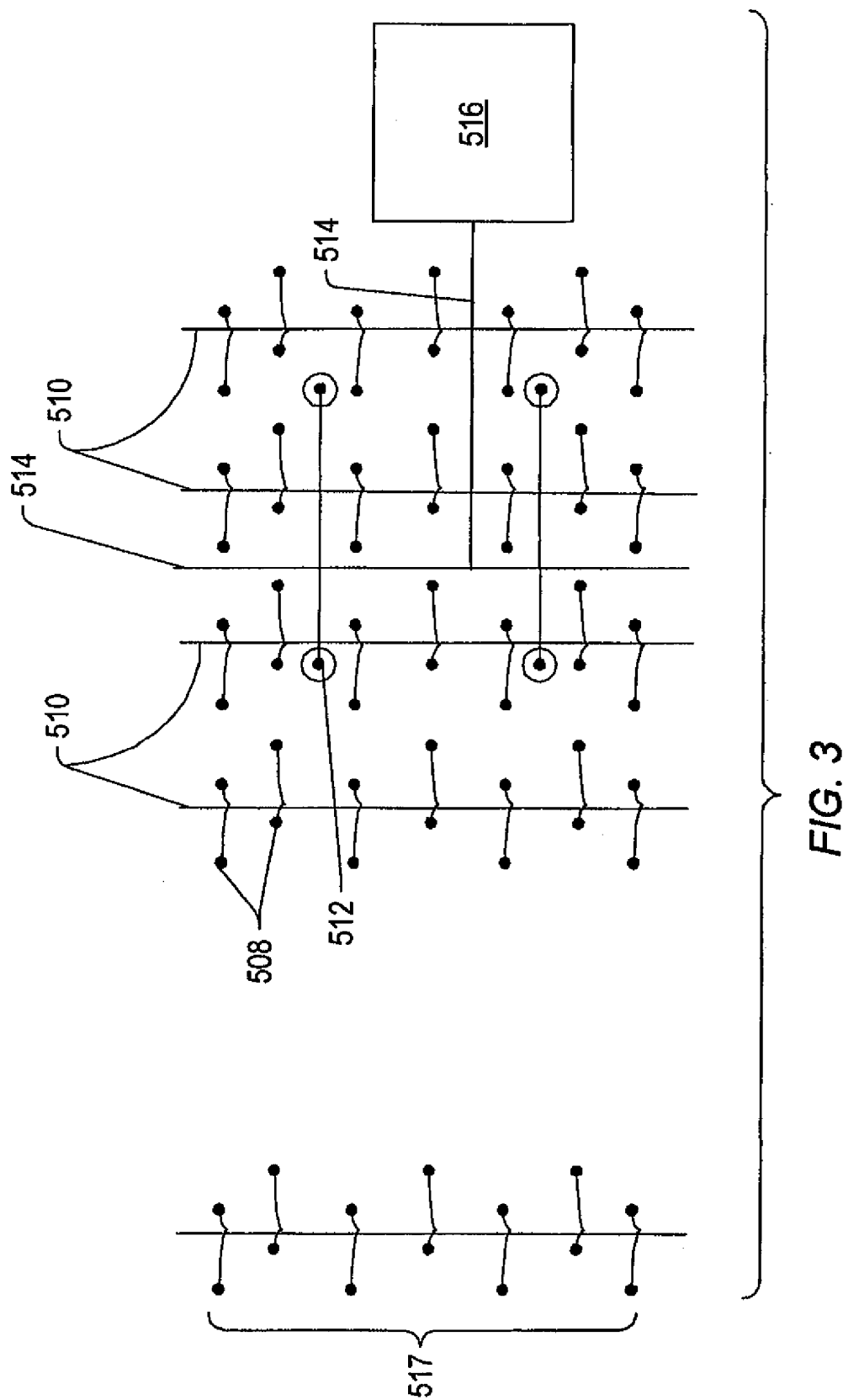


FIG. 2



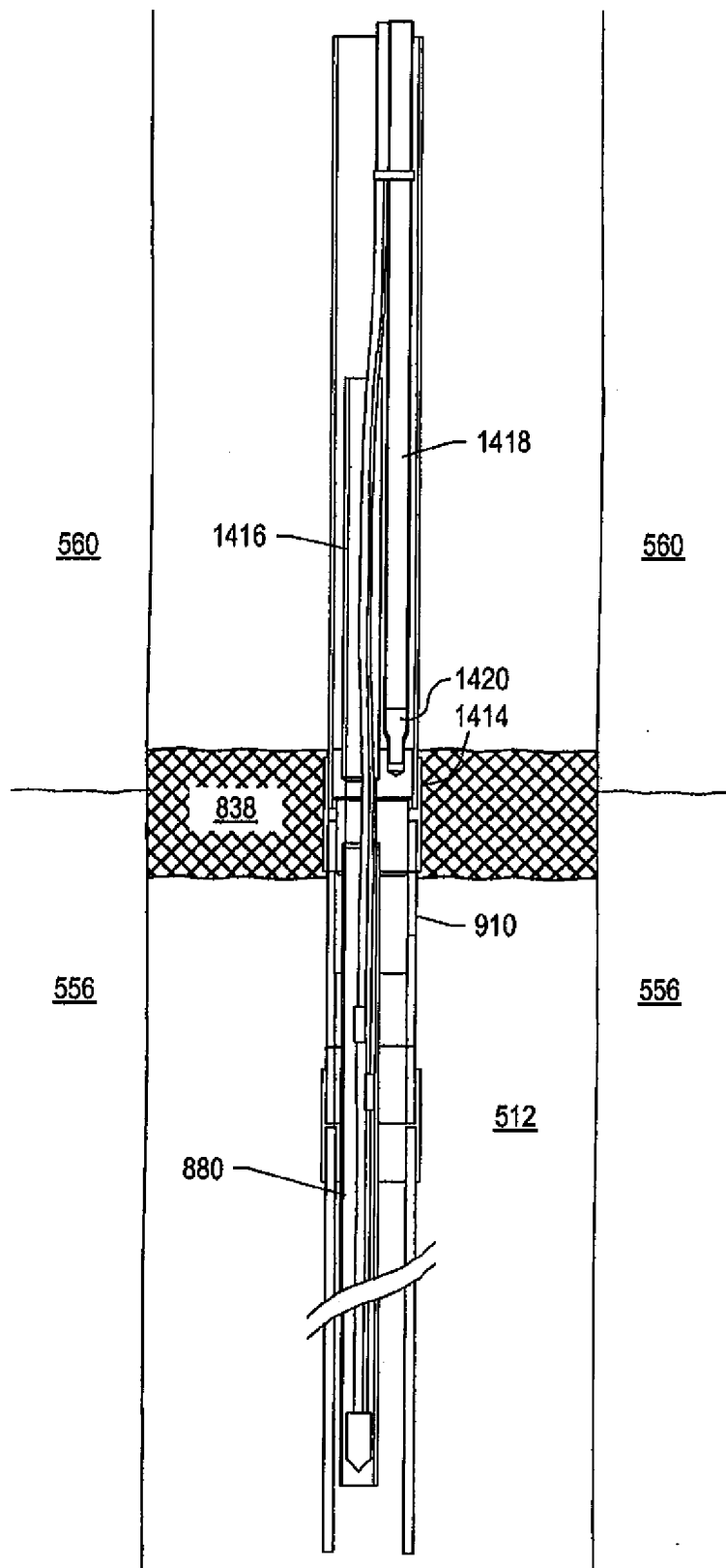


FIG. 4



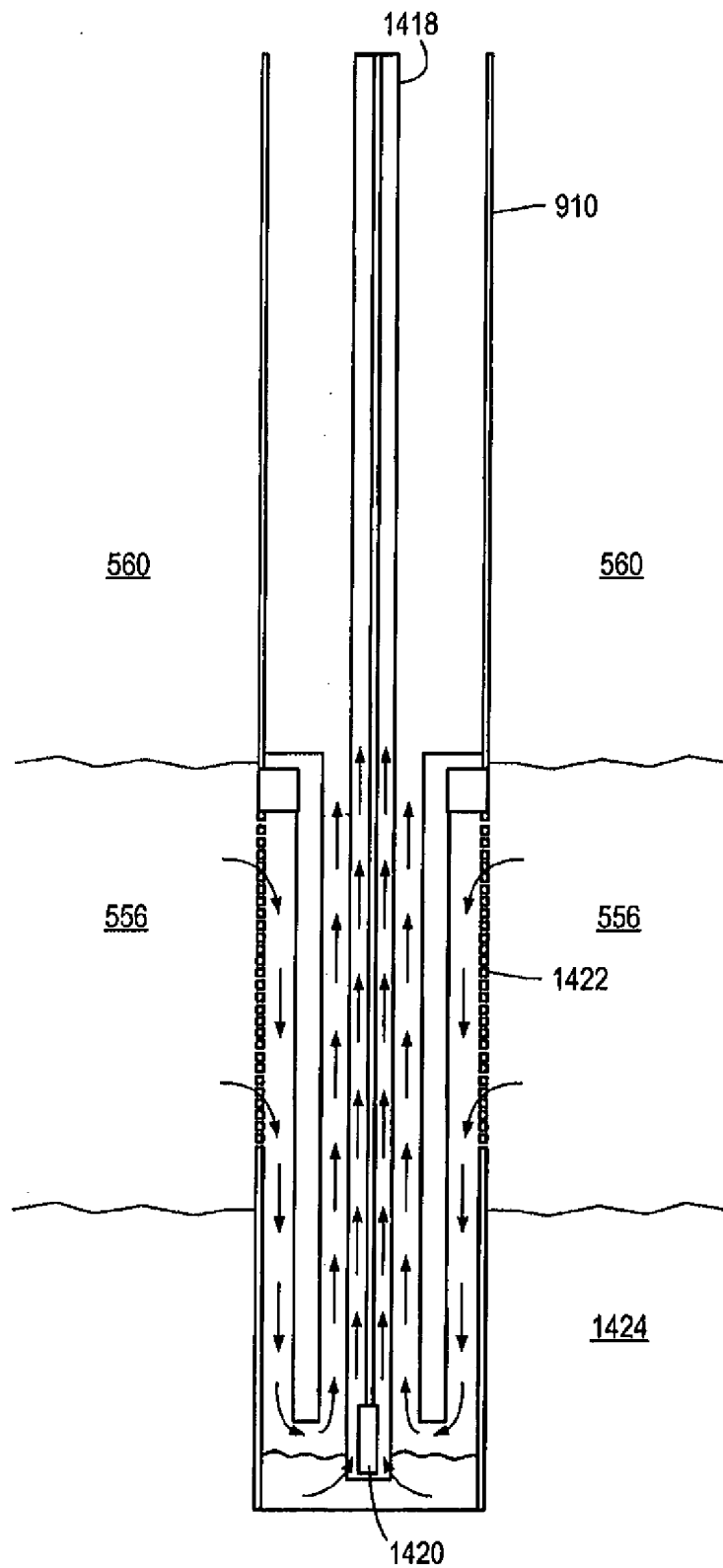


FIG. 5

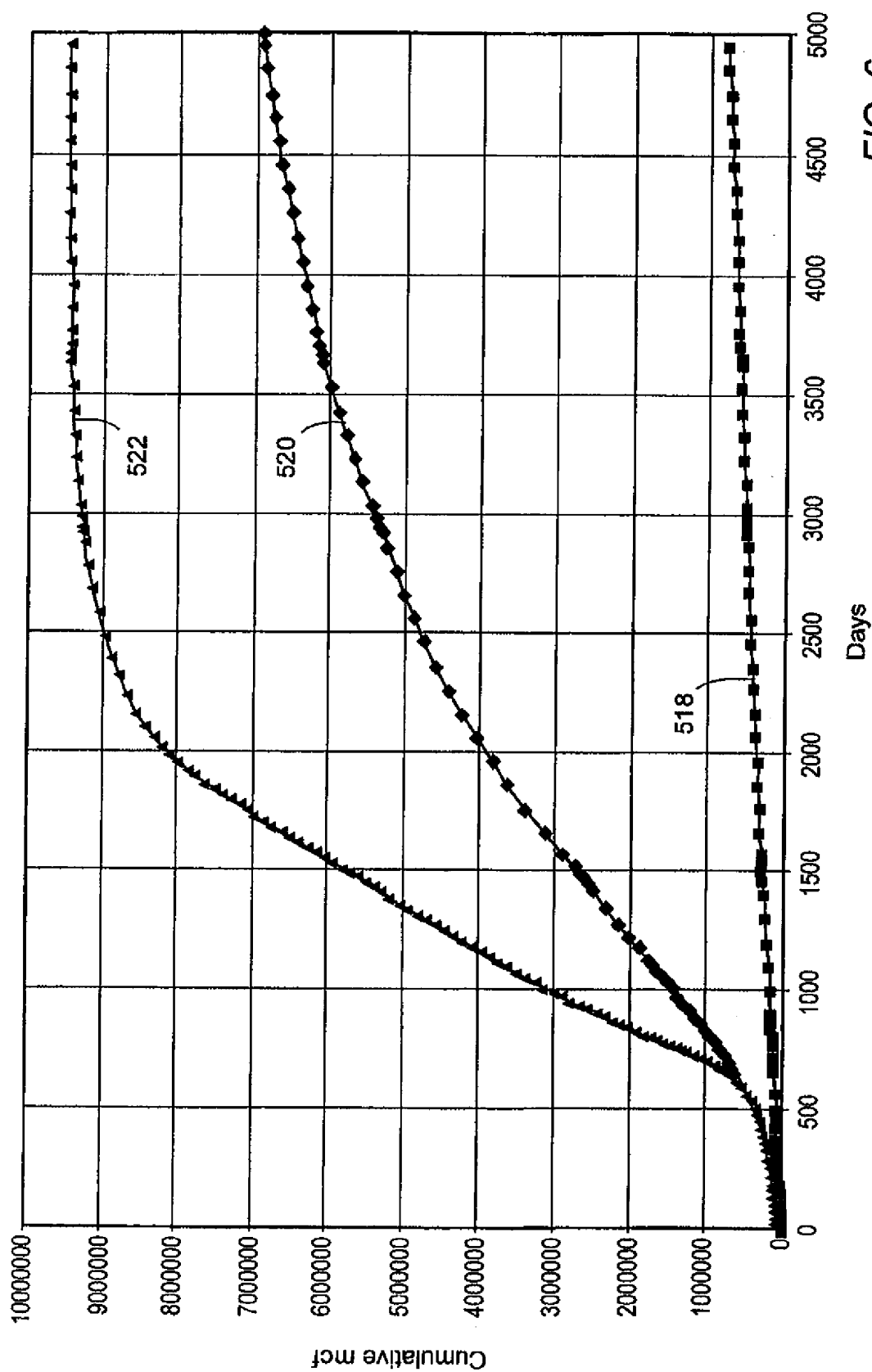
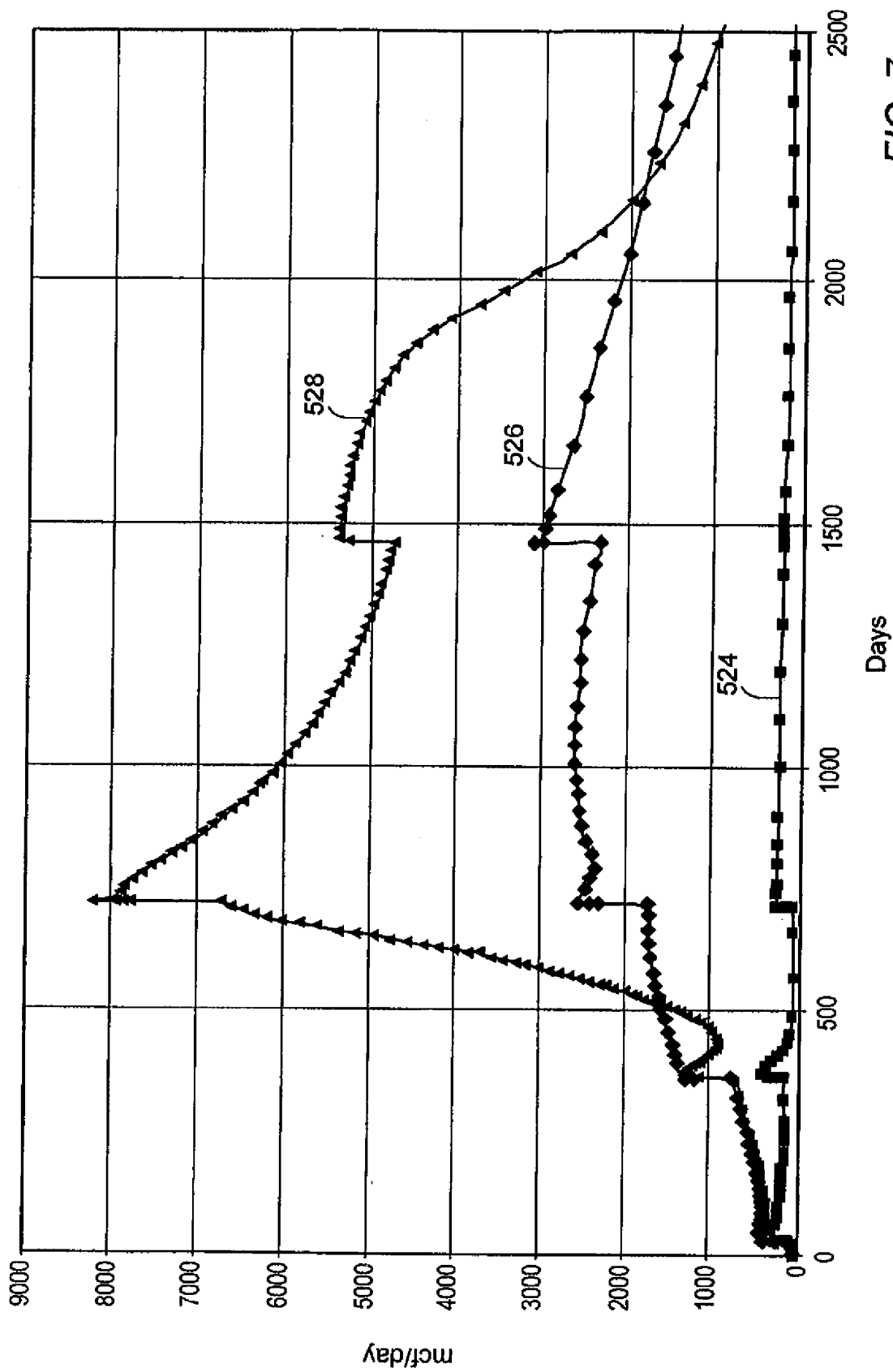


FIG. 6



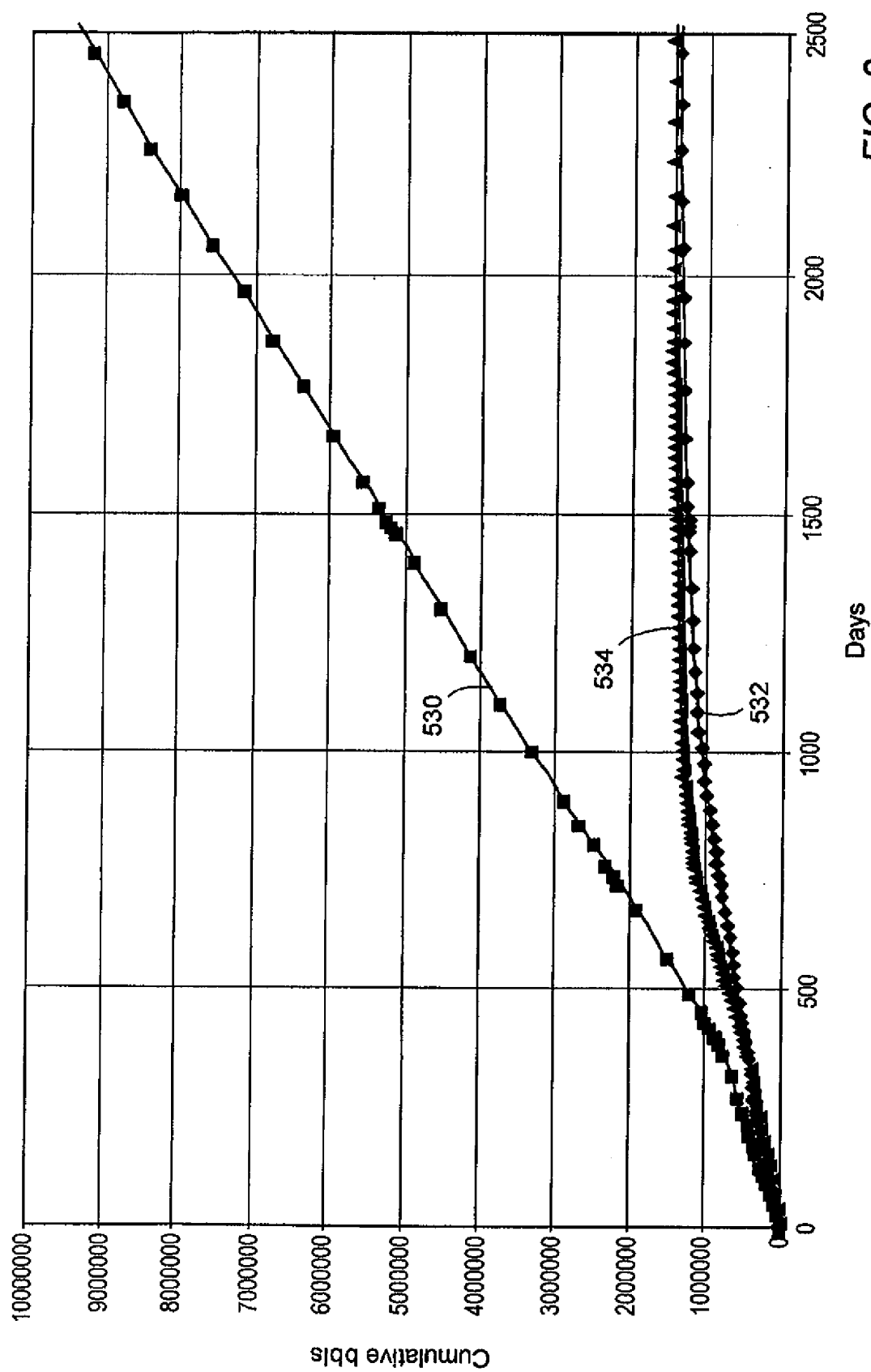
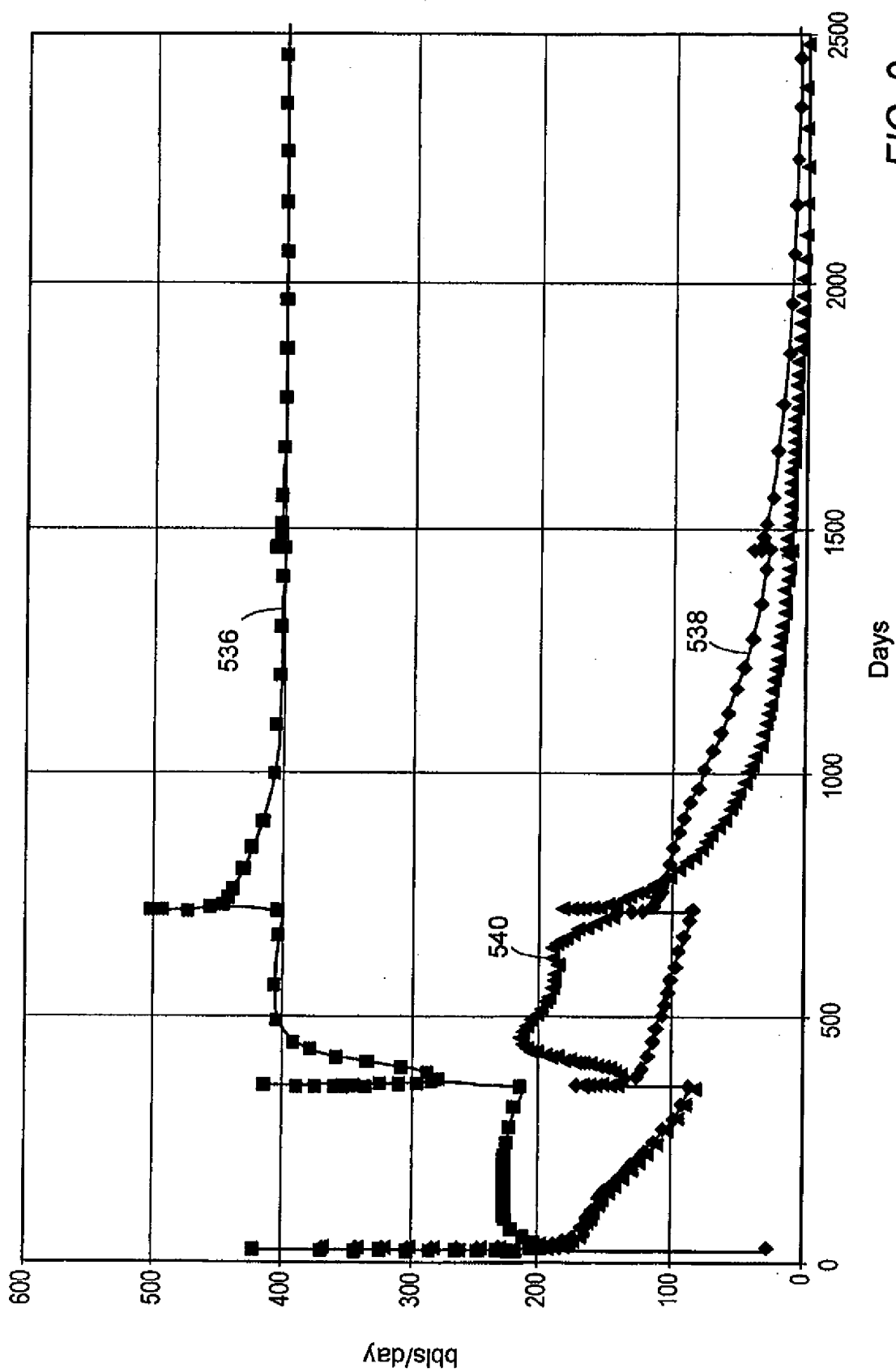


FIG. 8



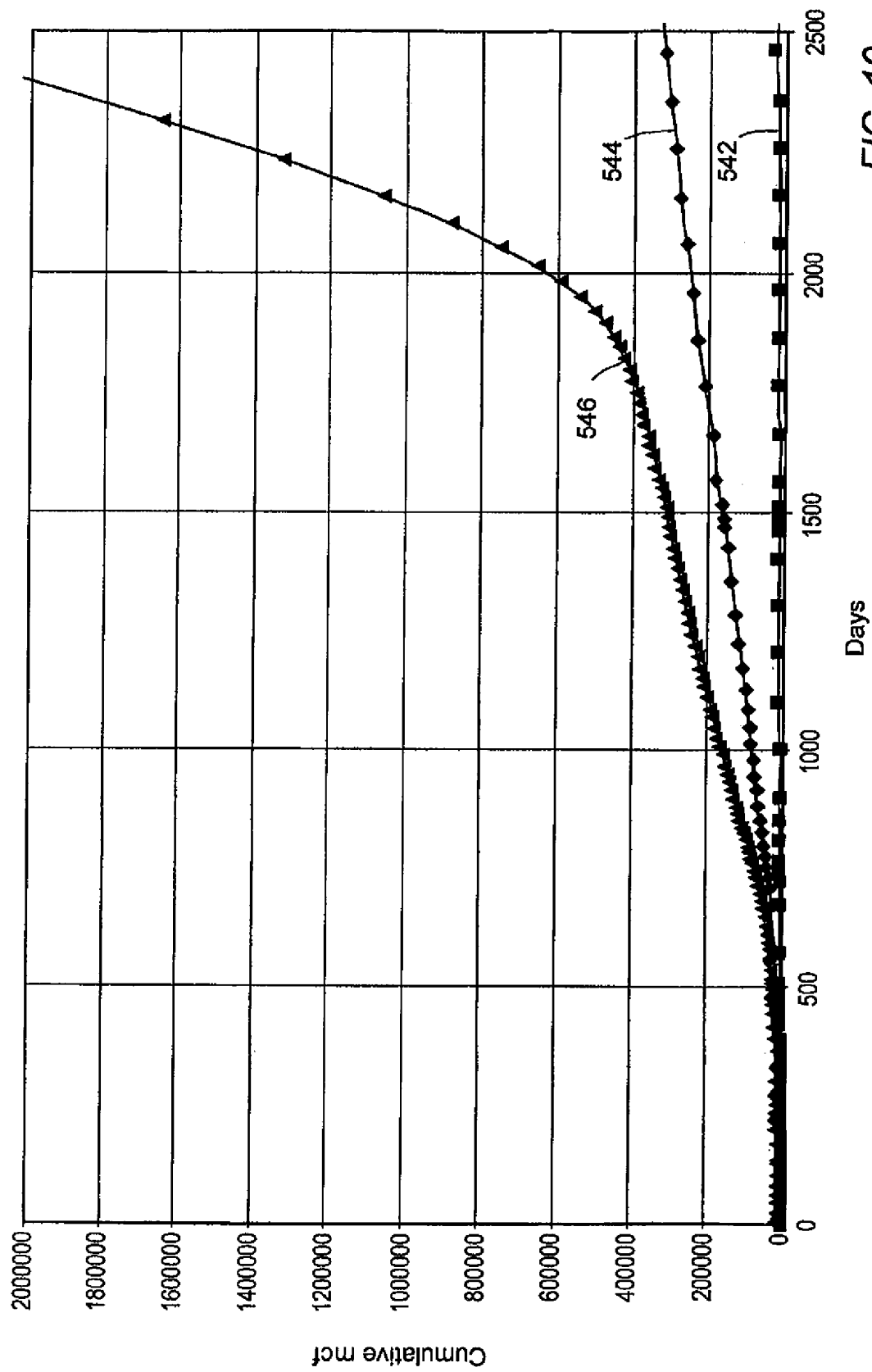
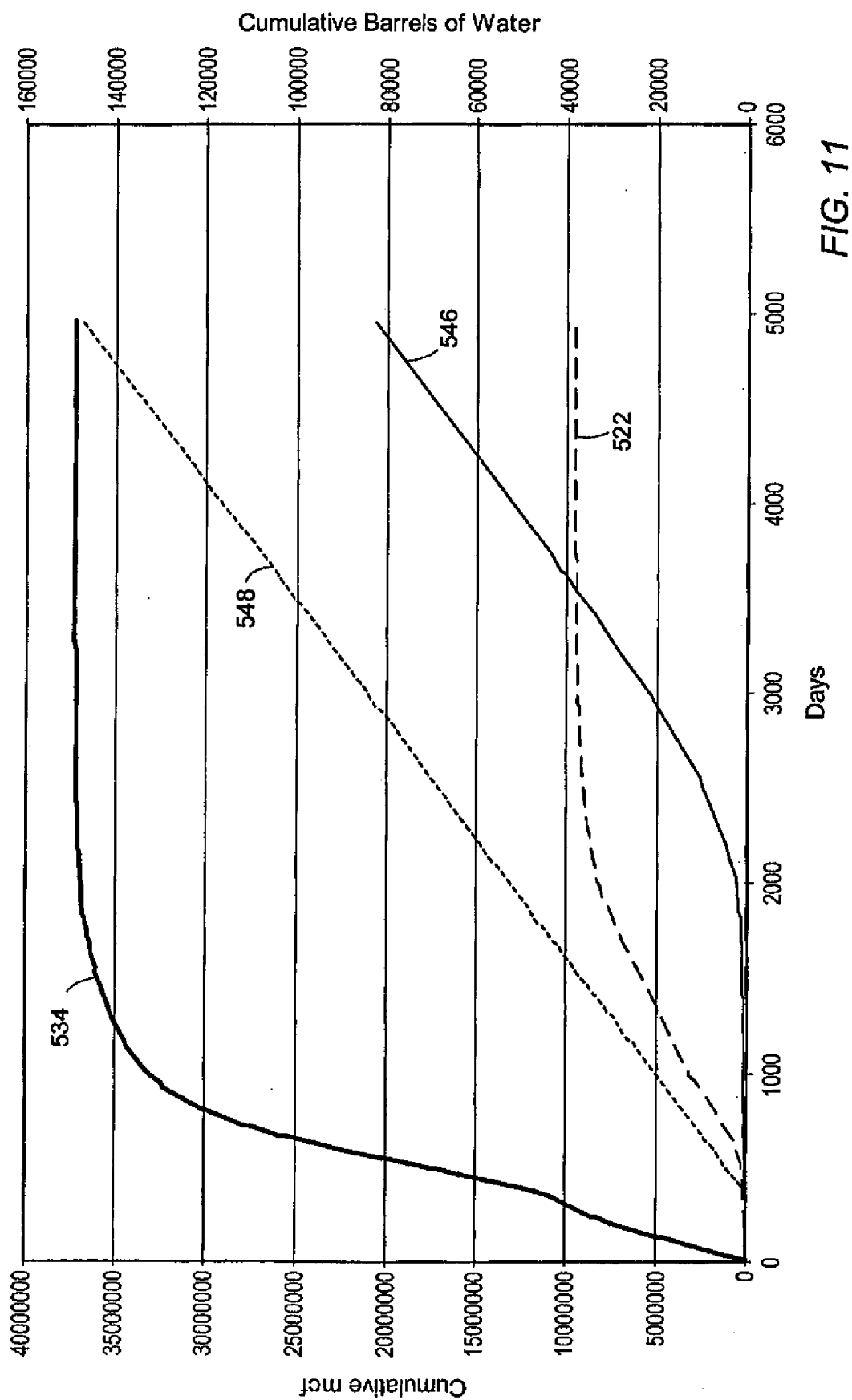


FIG. 10



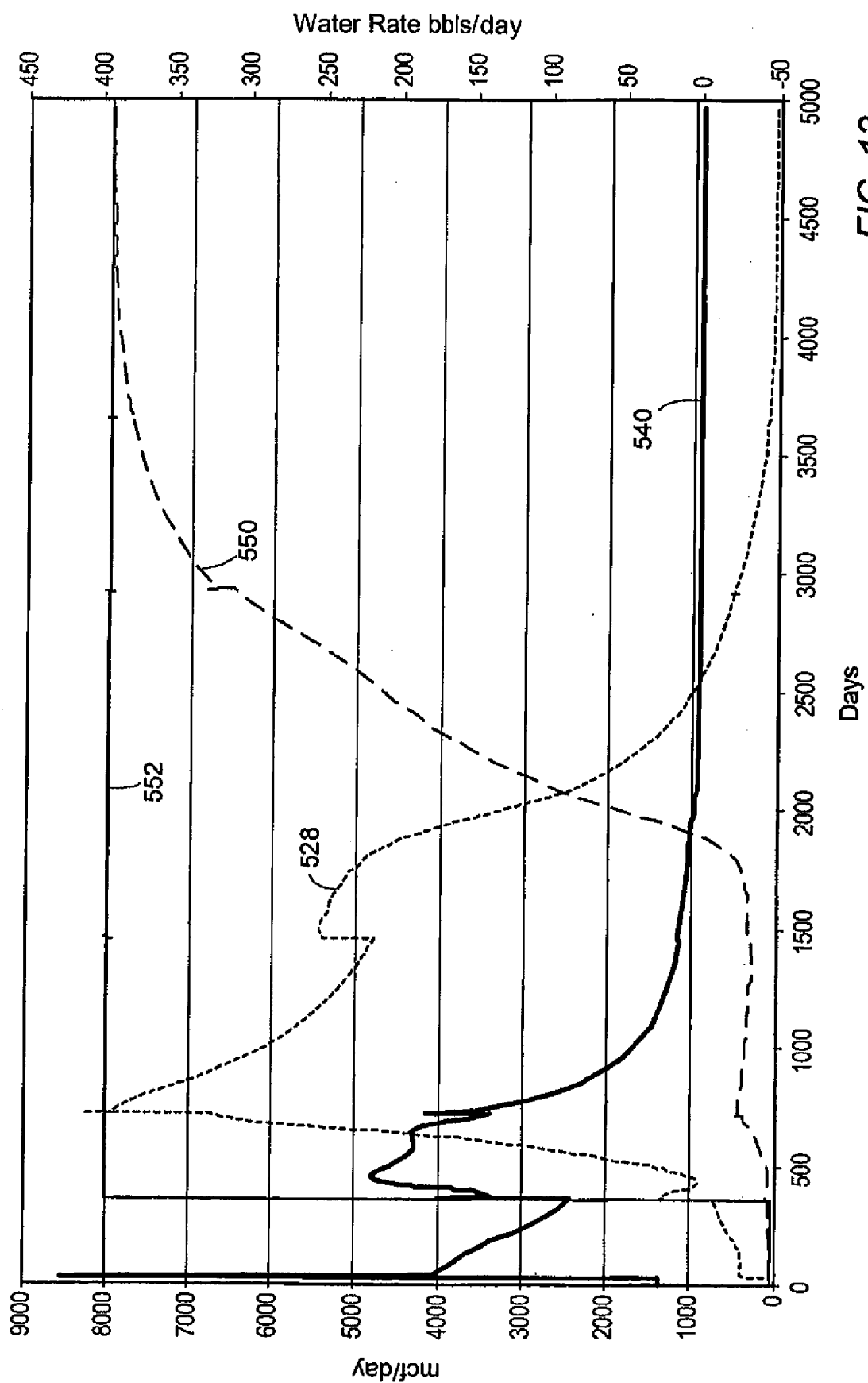


FIG. 12



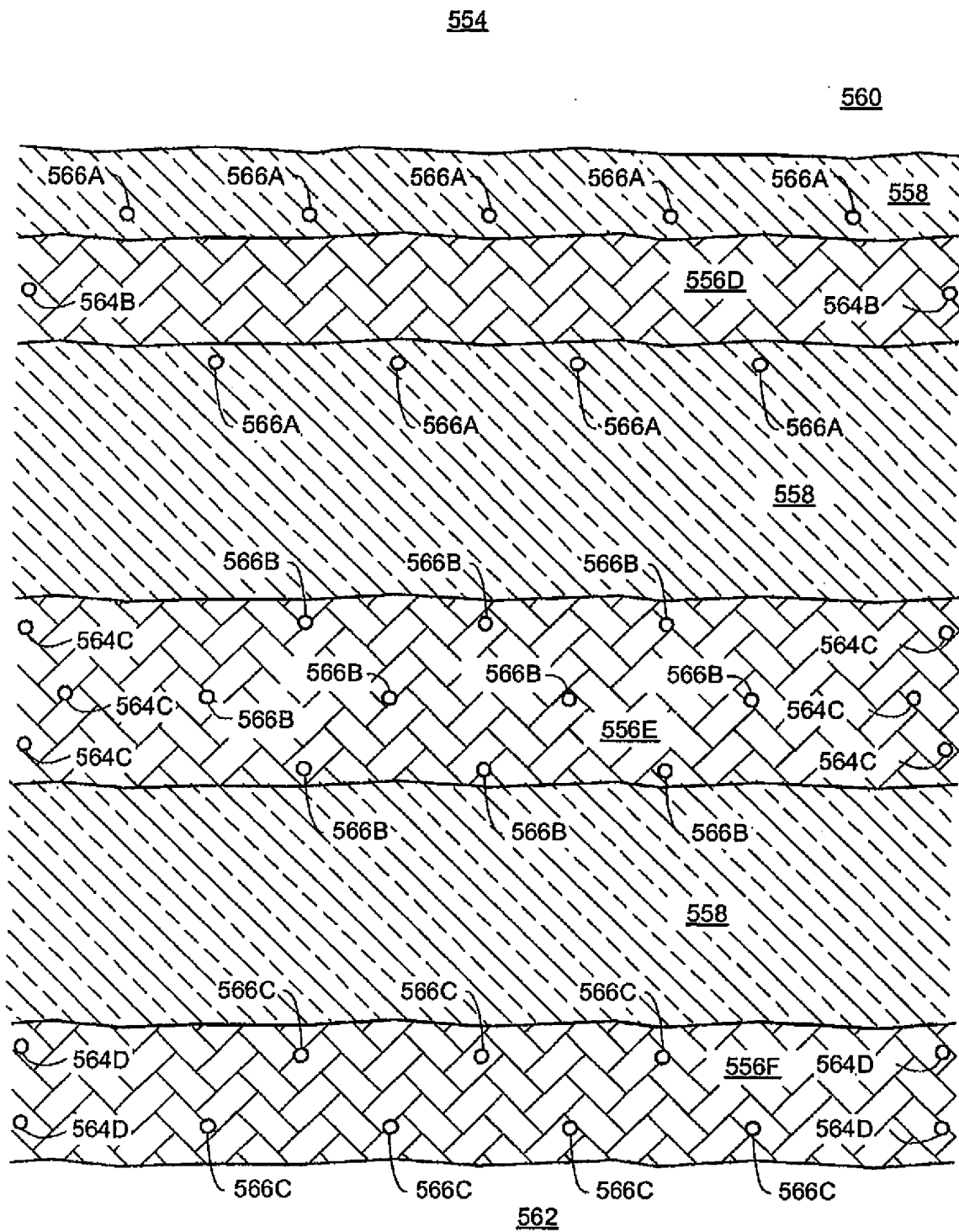


FIG. 13

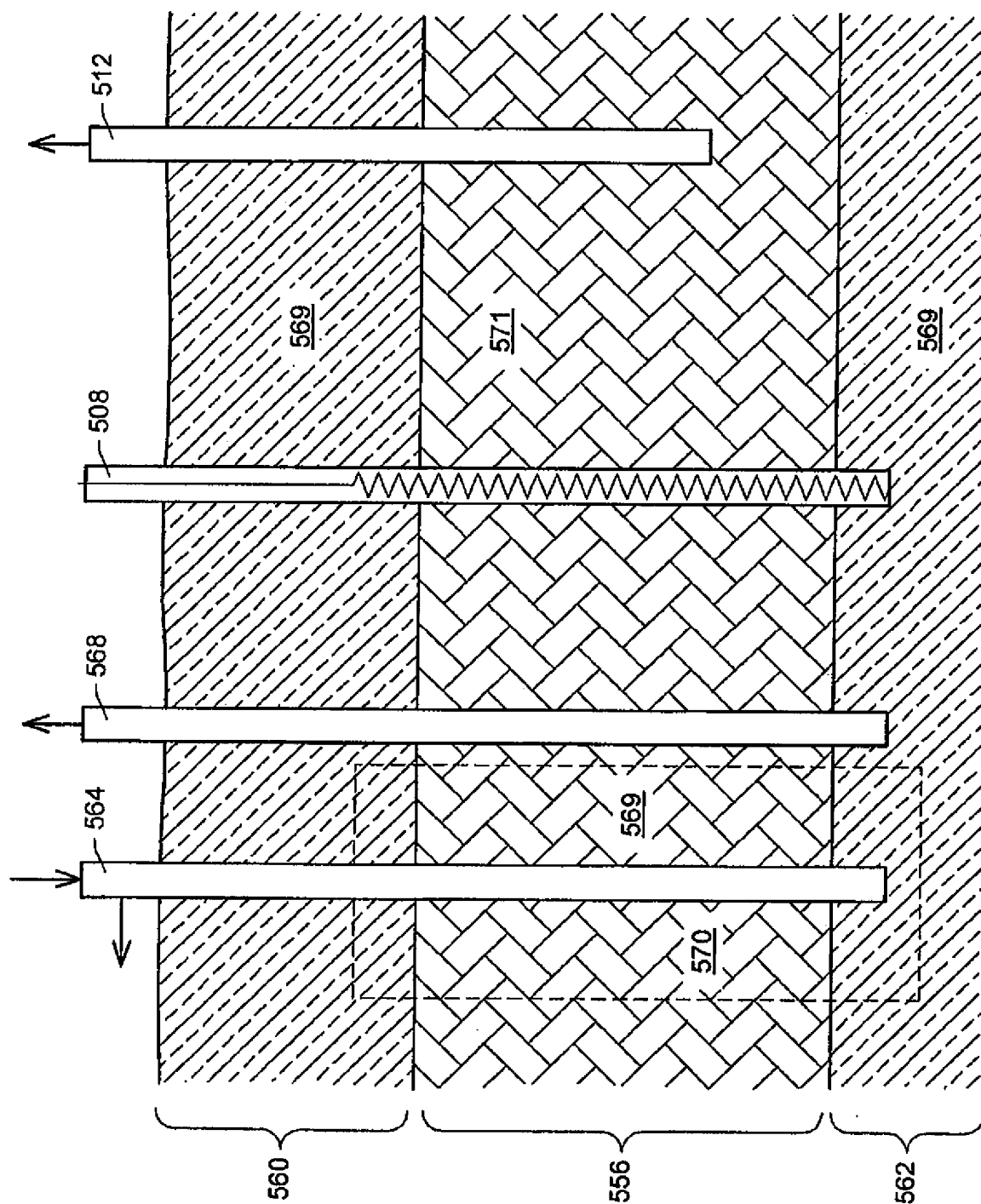


FIG. 14

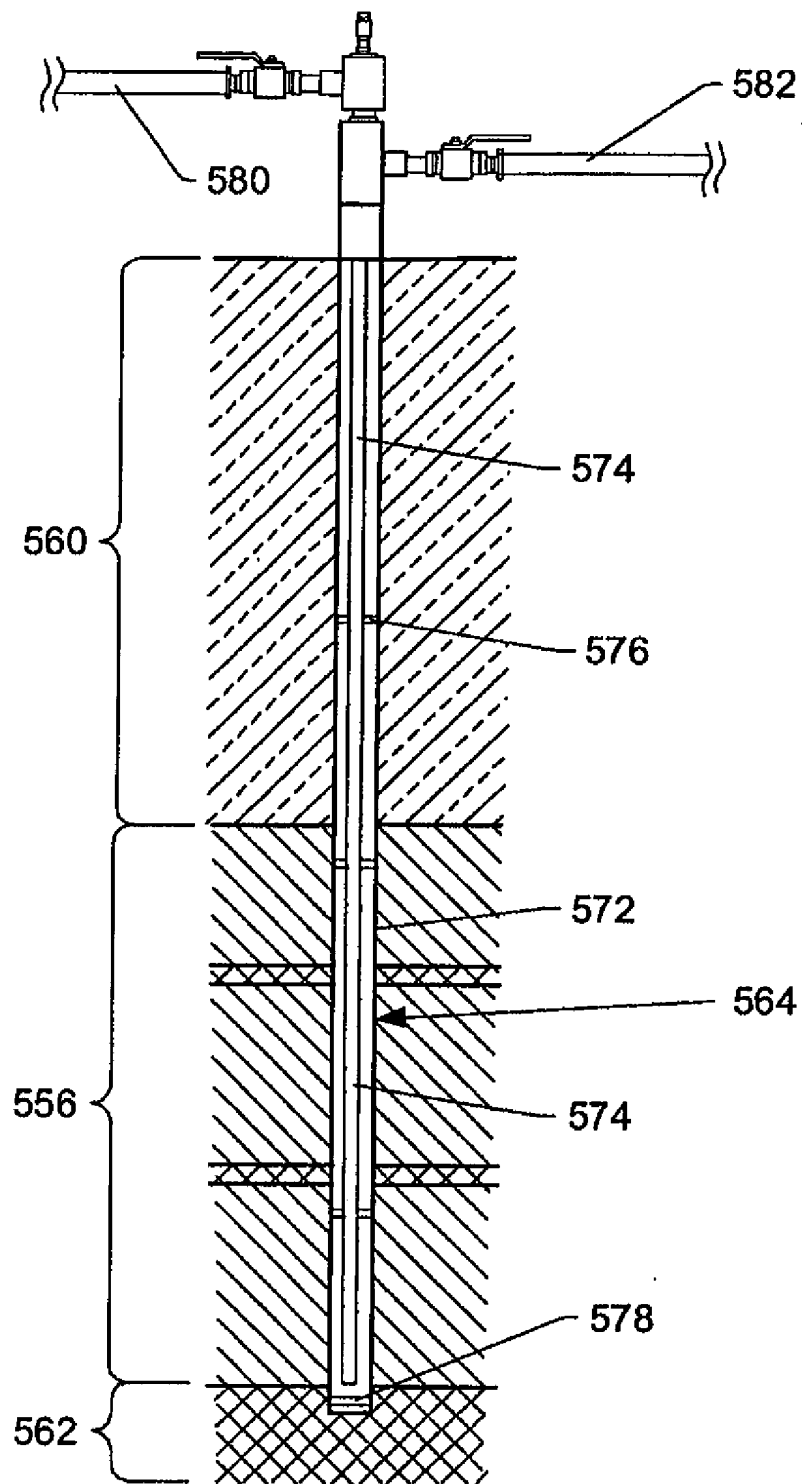


FIG. 15

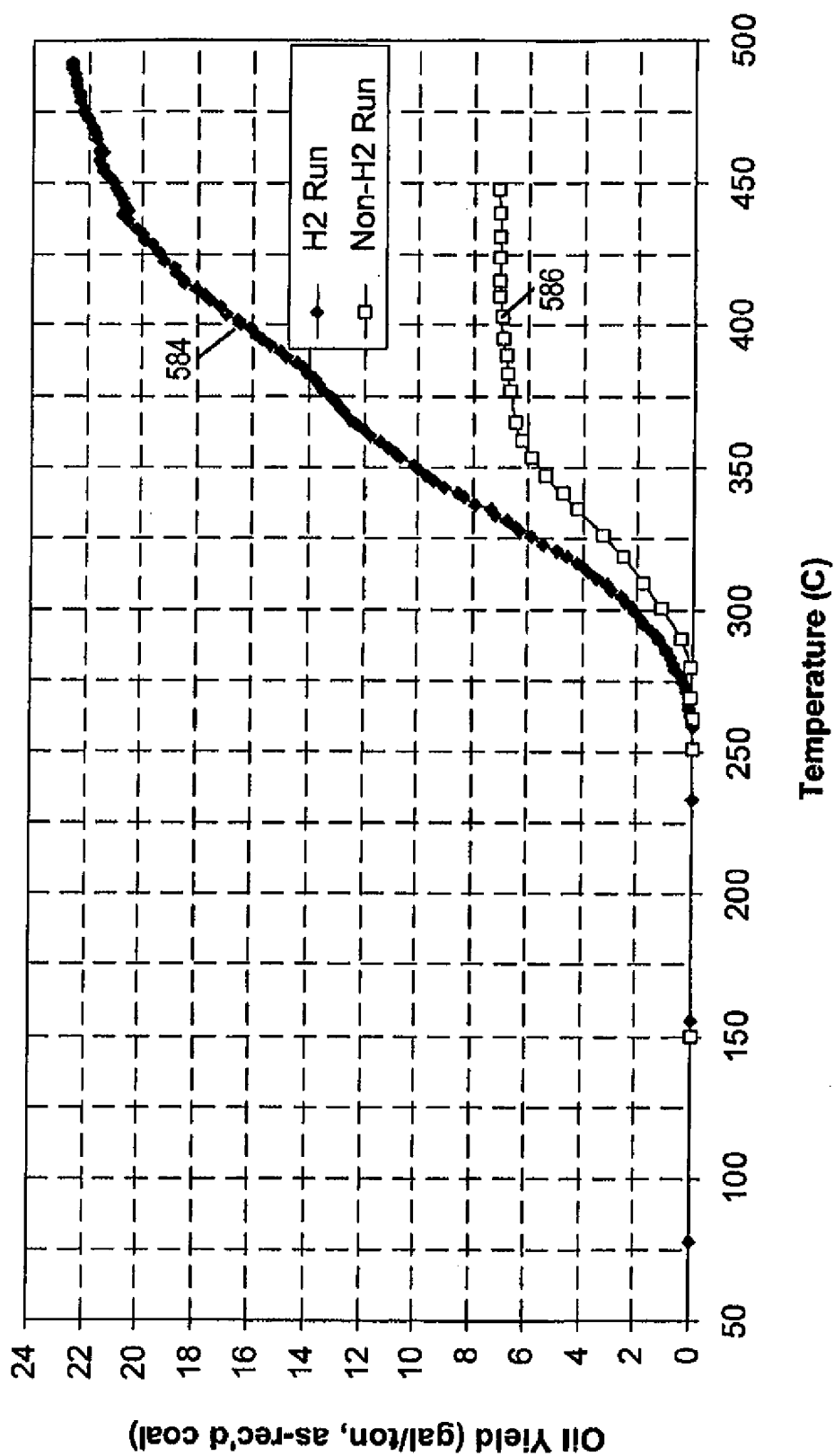


FIG. 16

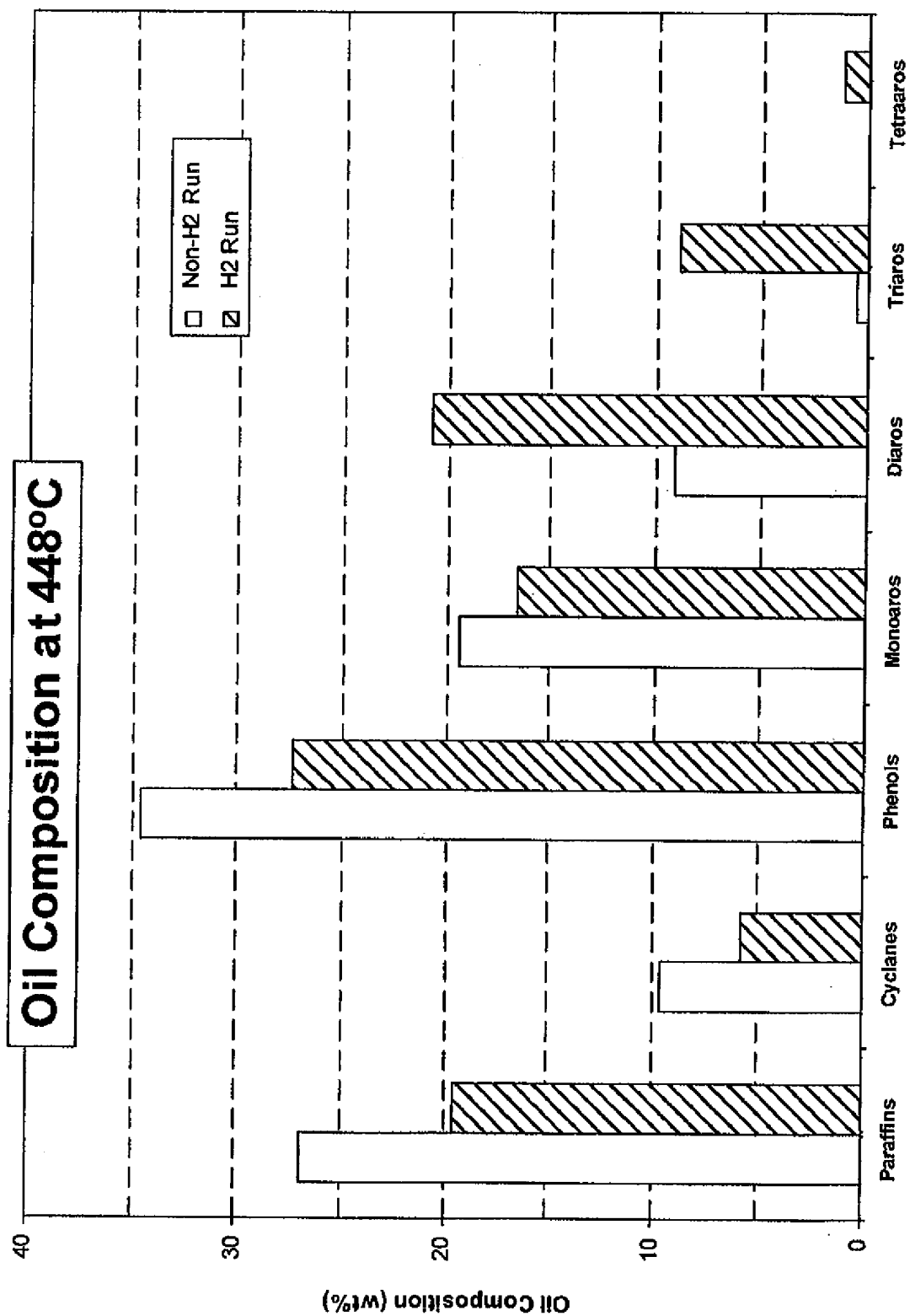
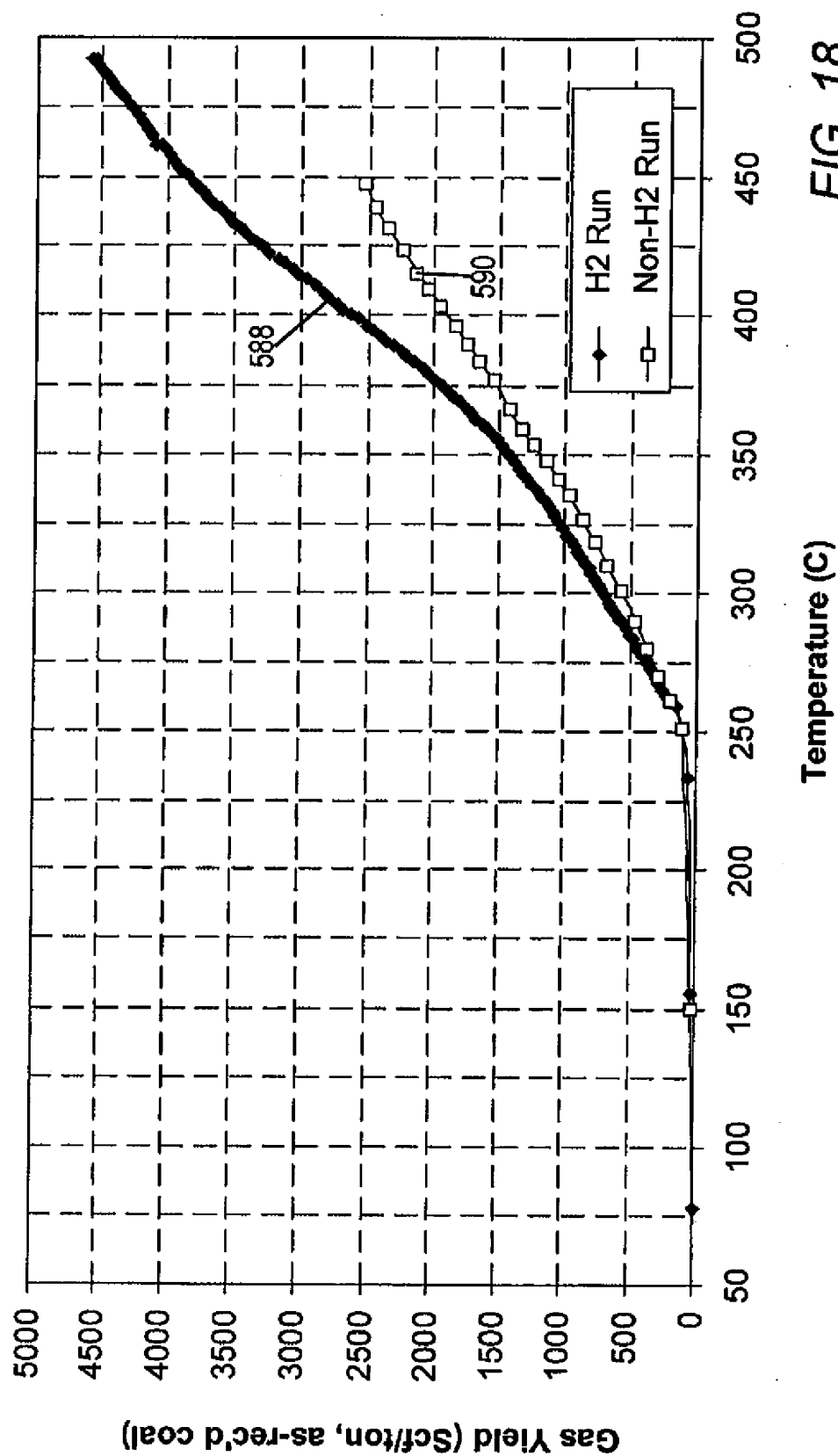


FIG. 17



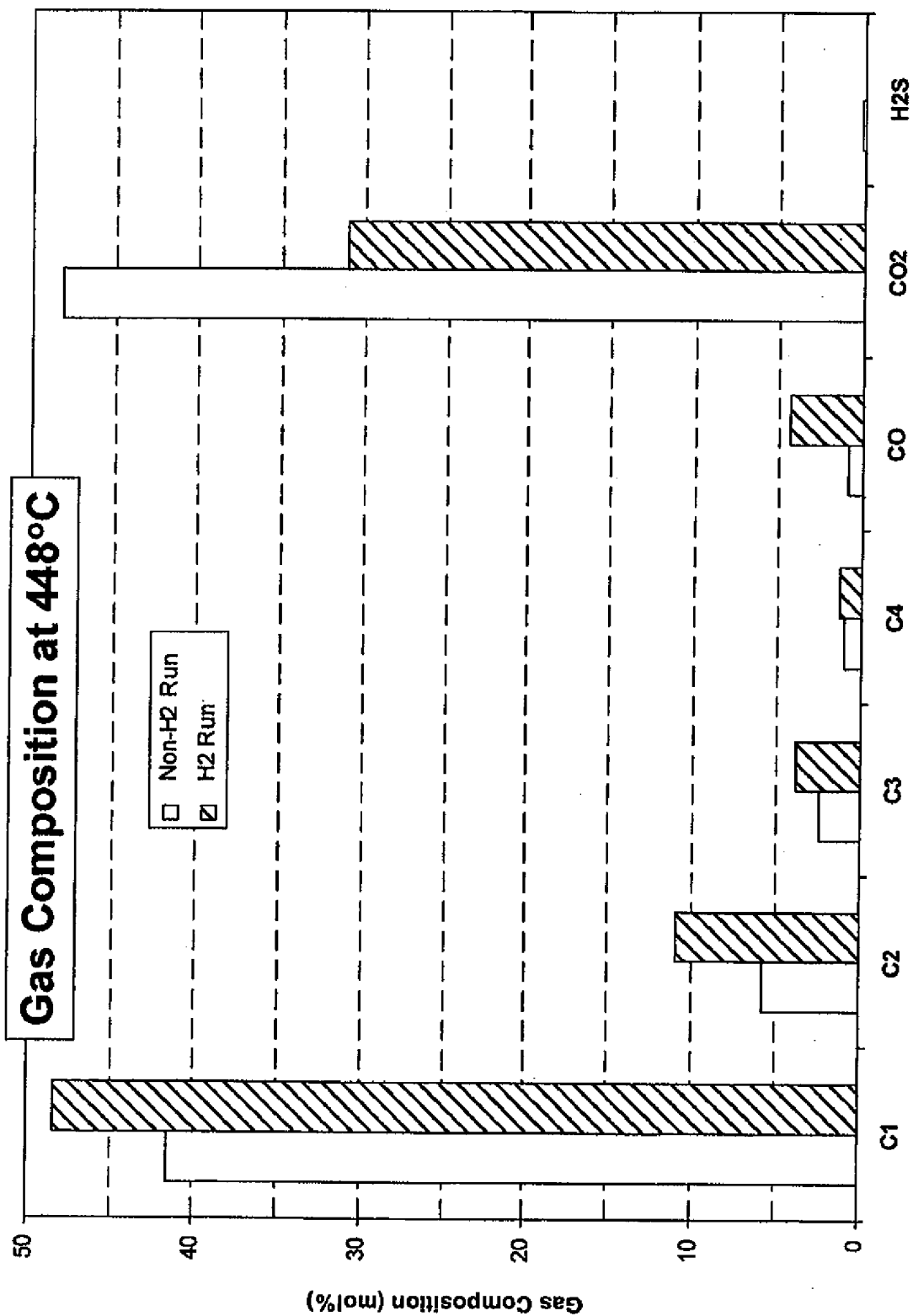


FIG. 19

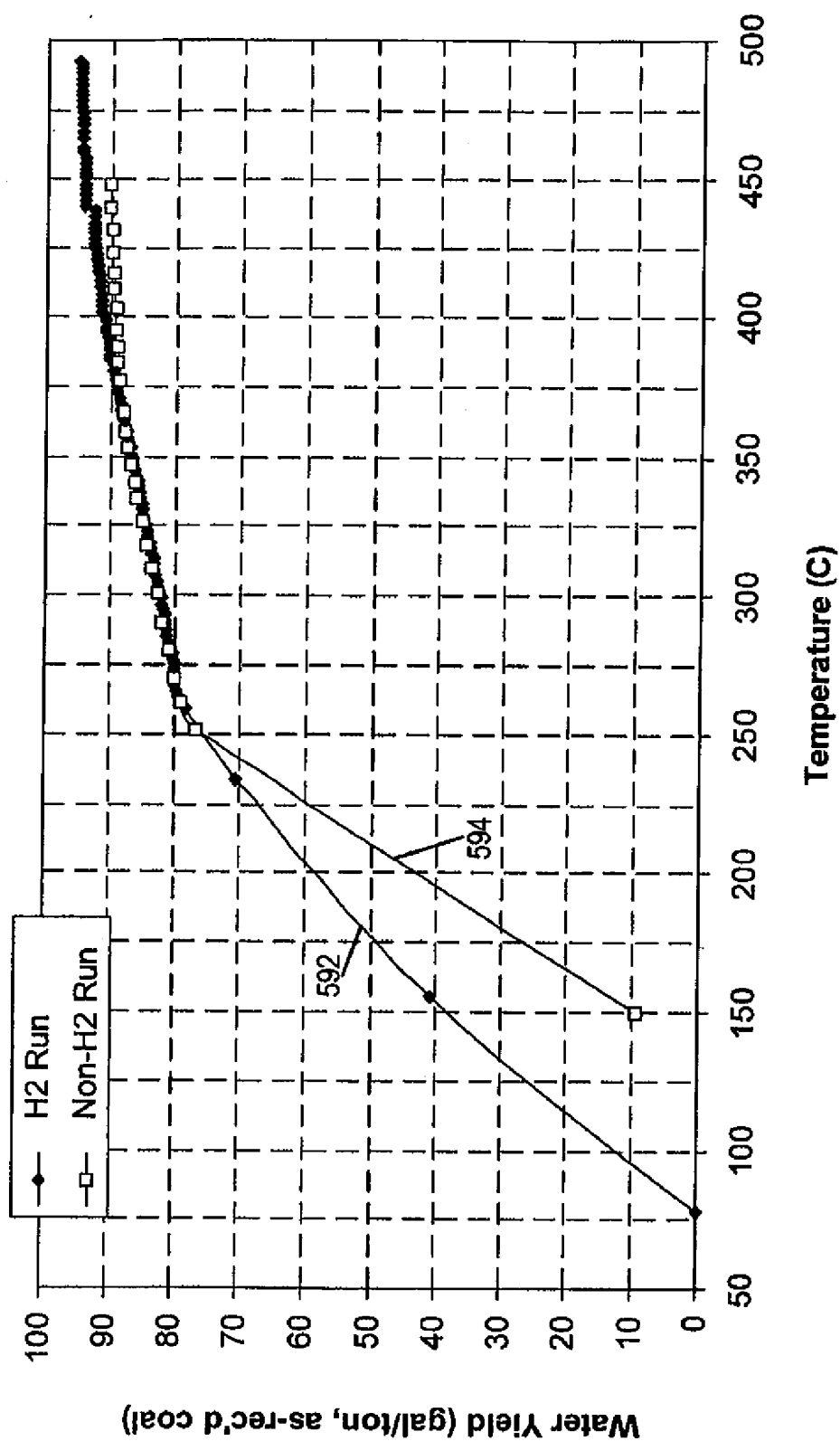


FIG. 20



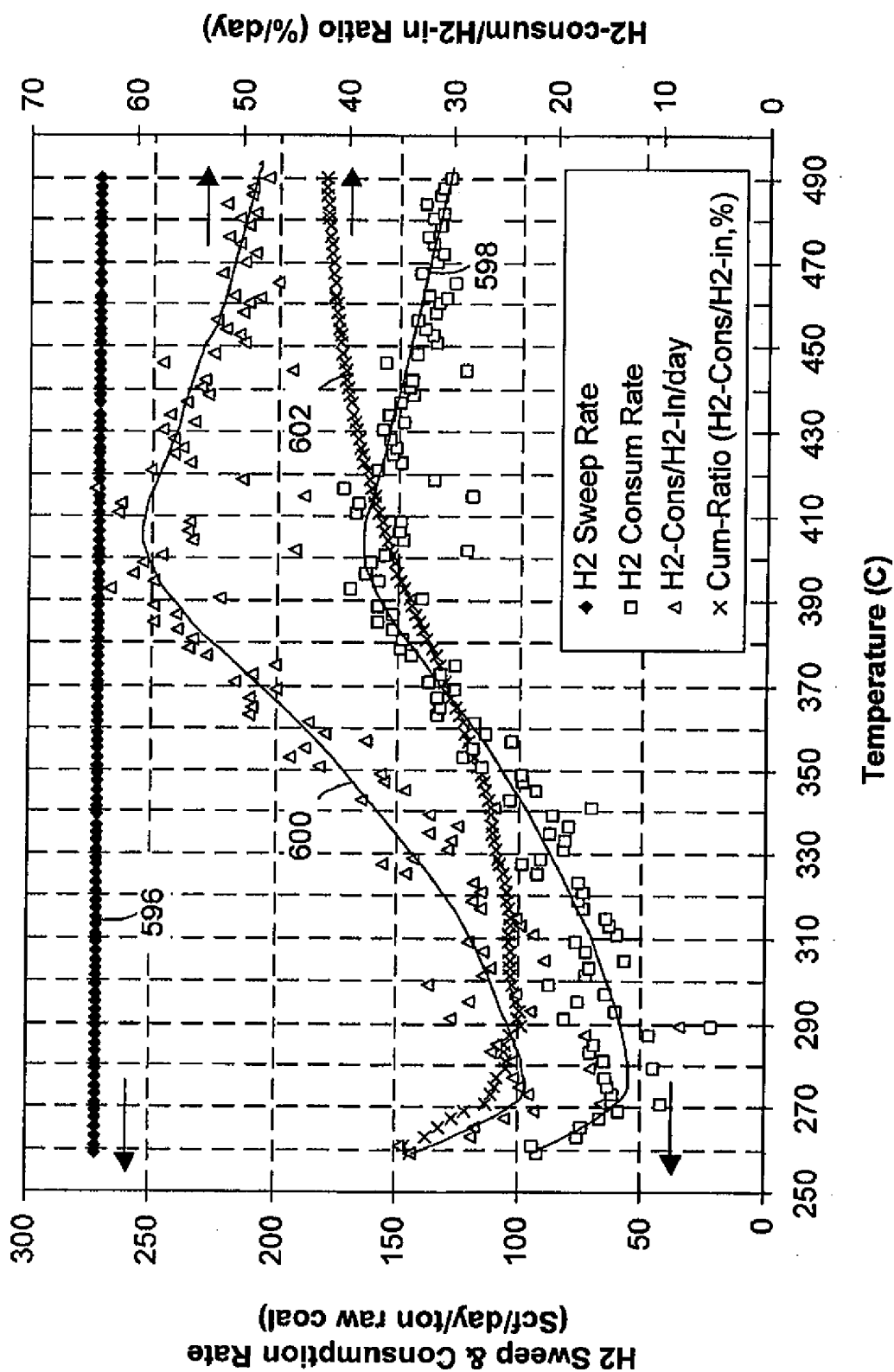


FIG. 21

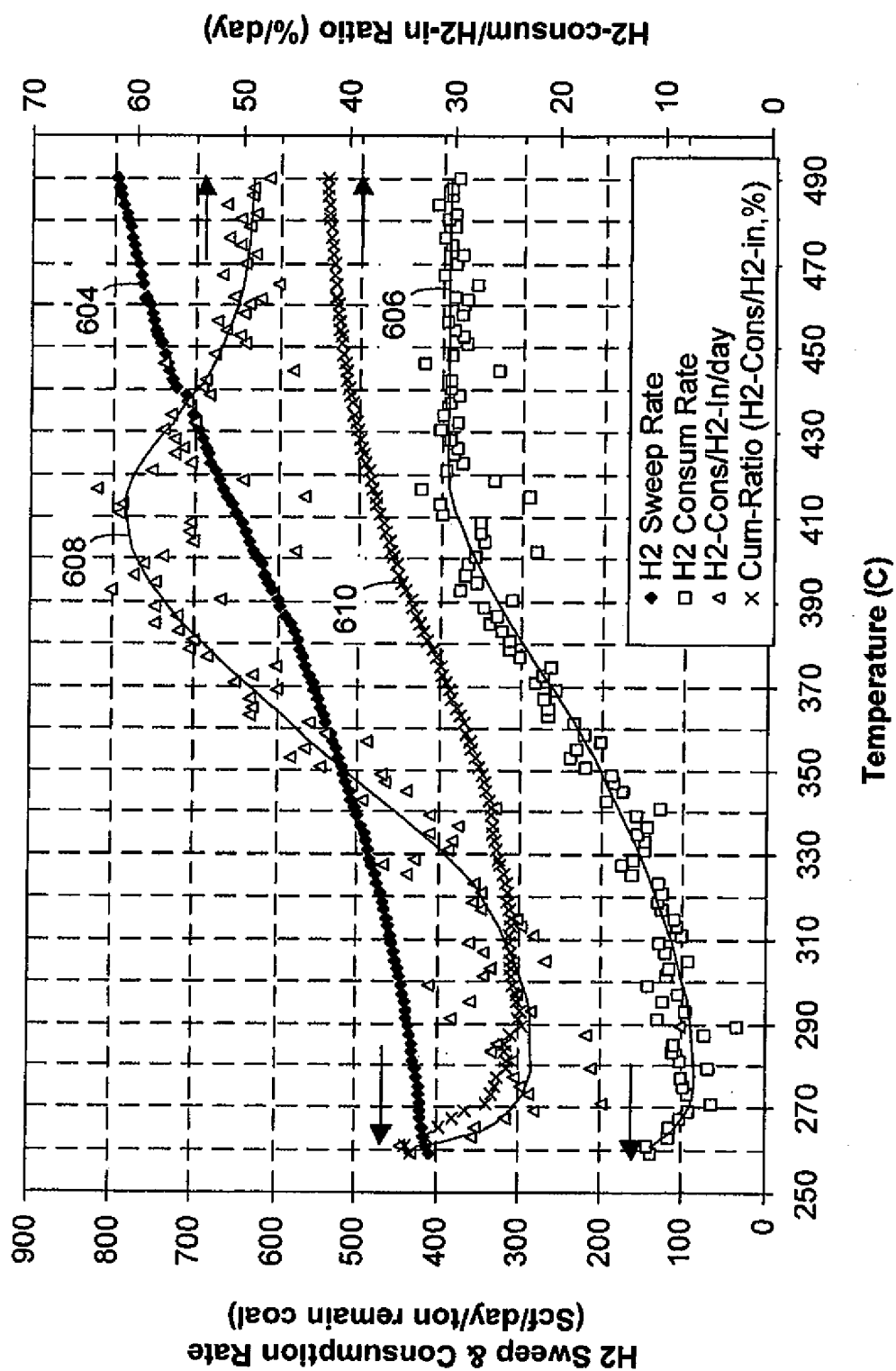


FIG. 22

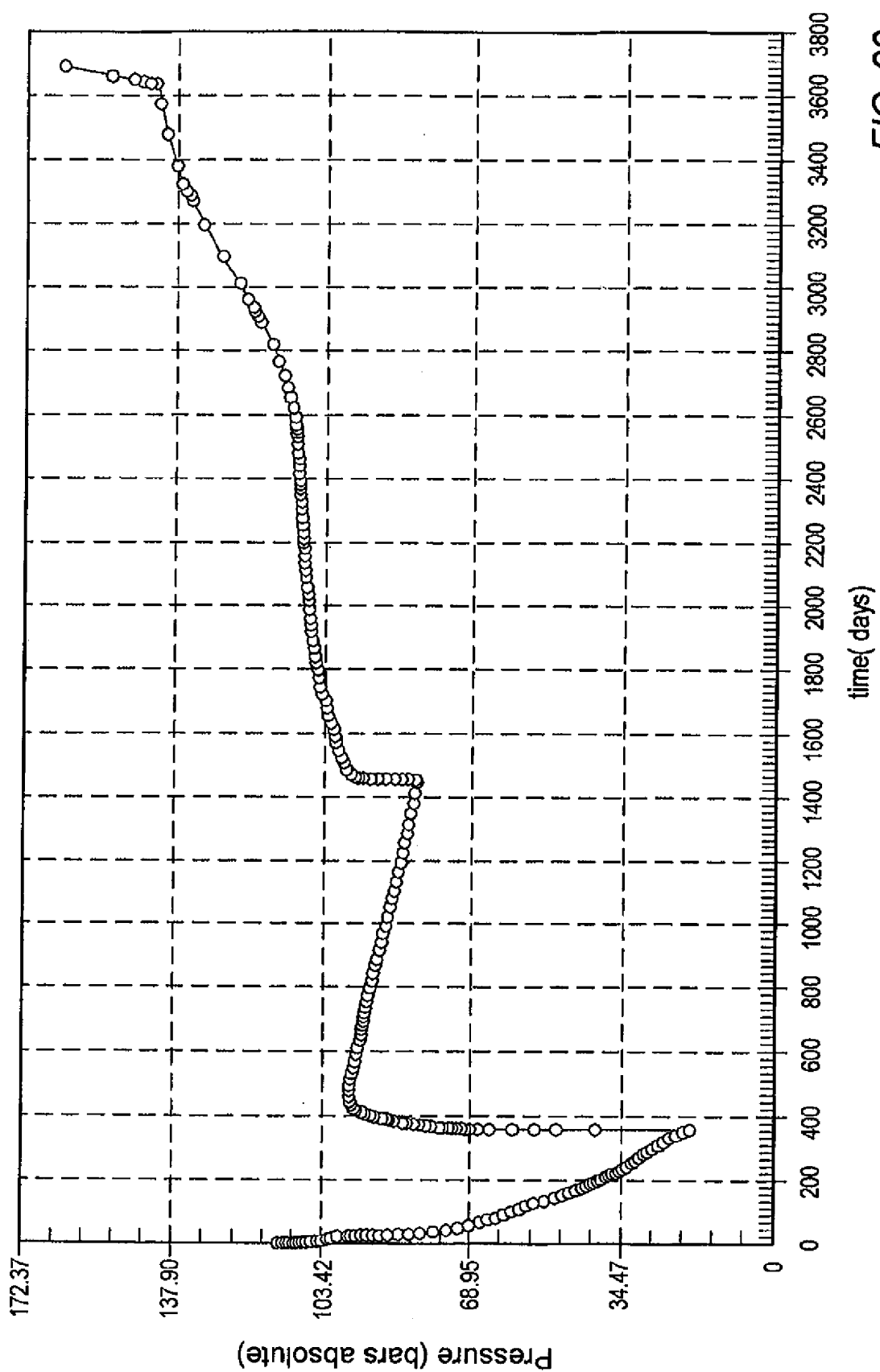


FIG. 23

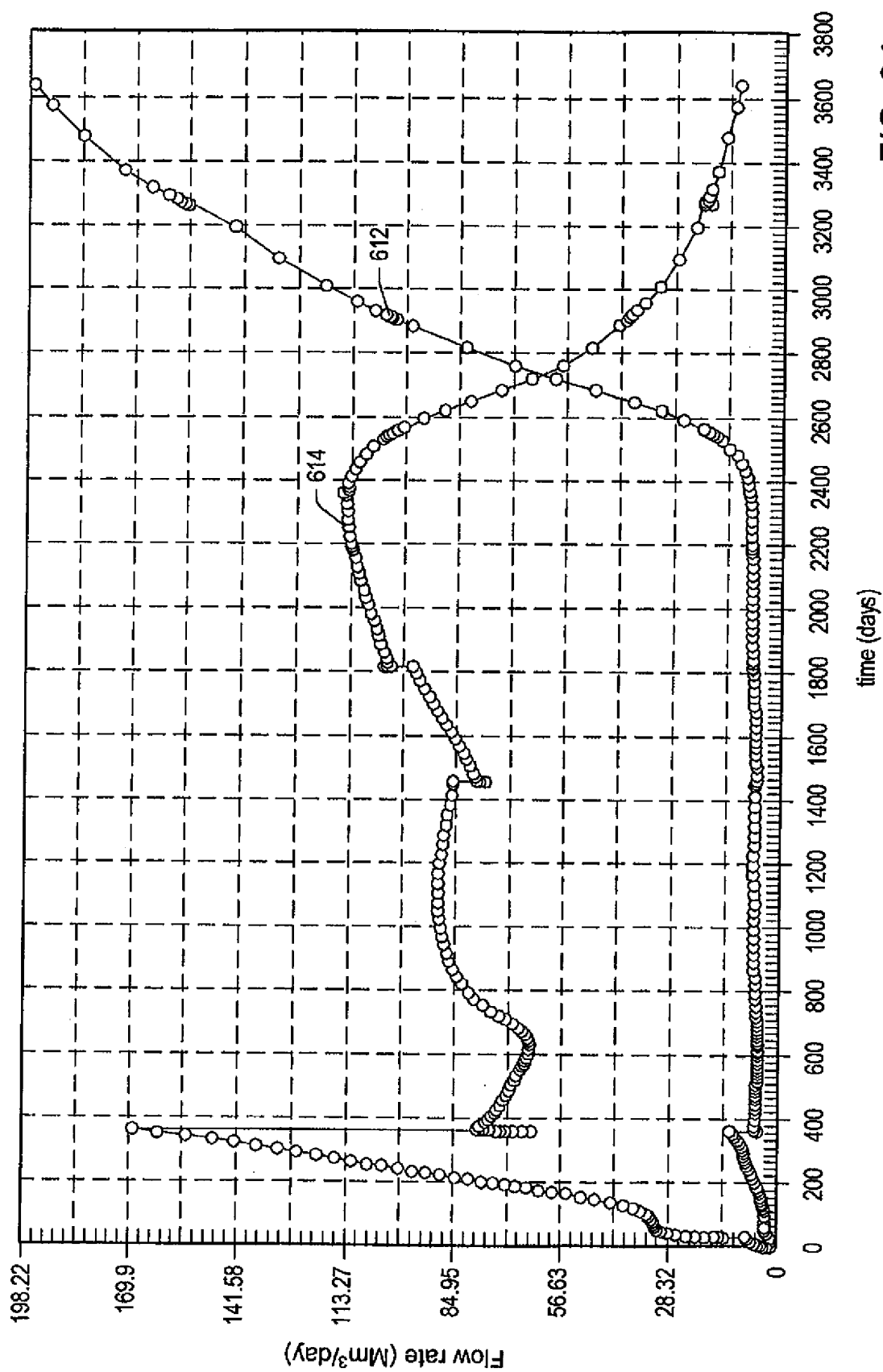


FIG. 24

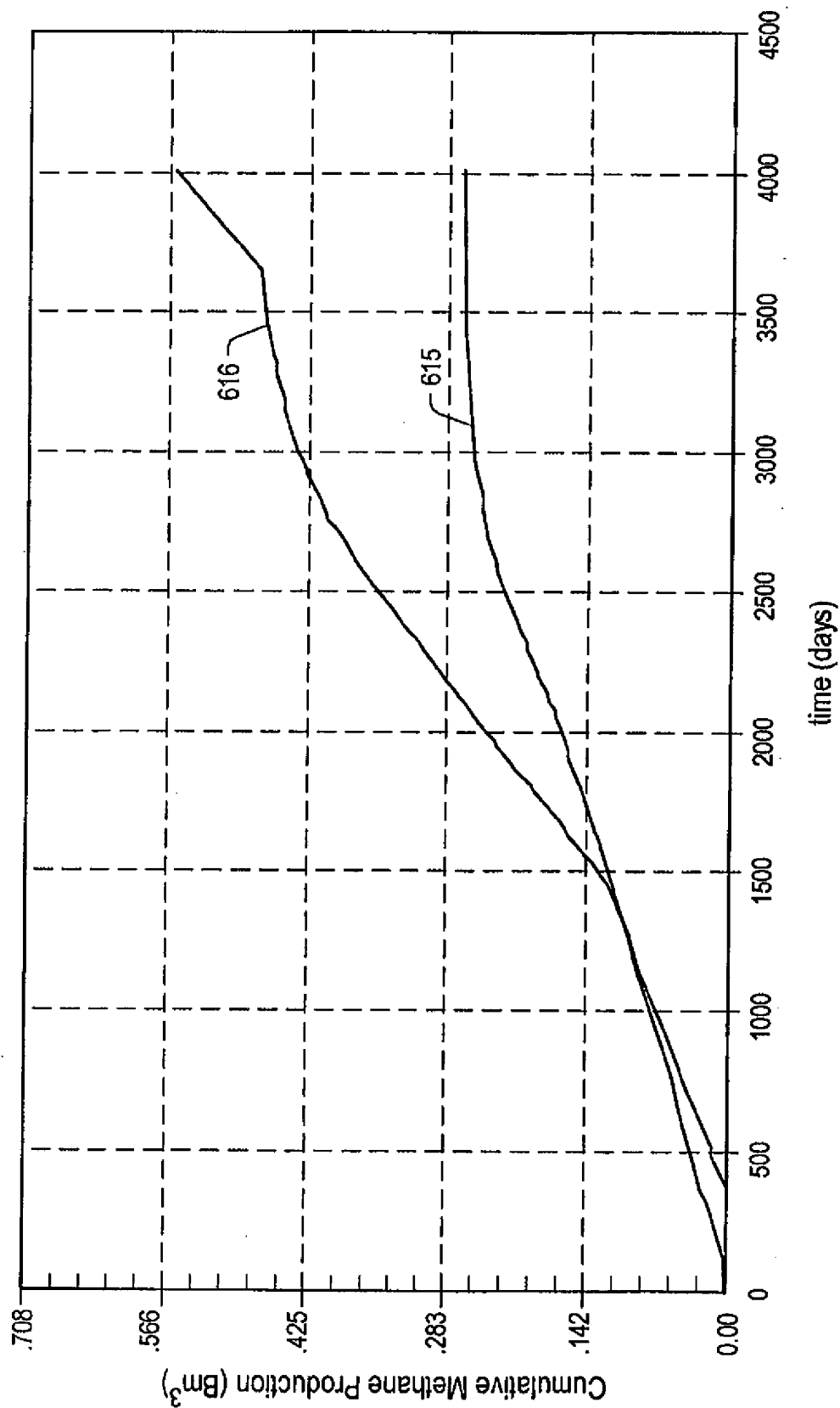


FIG. 25

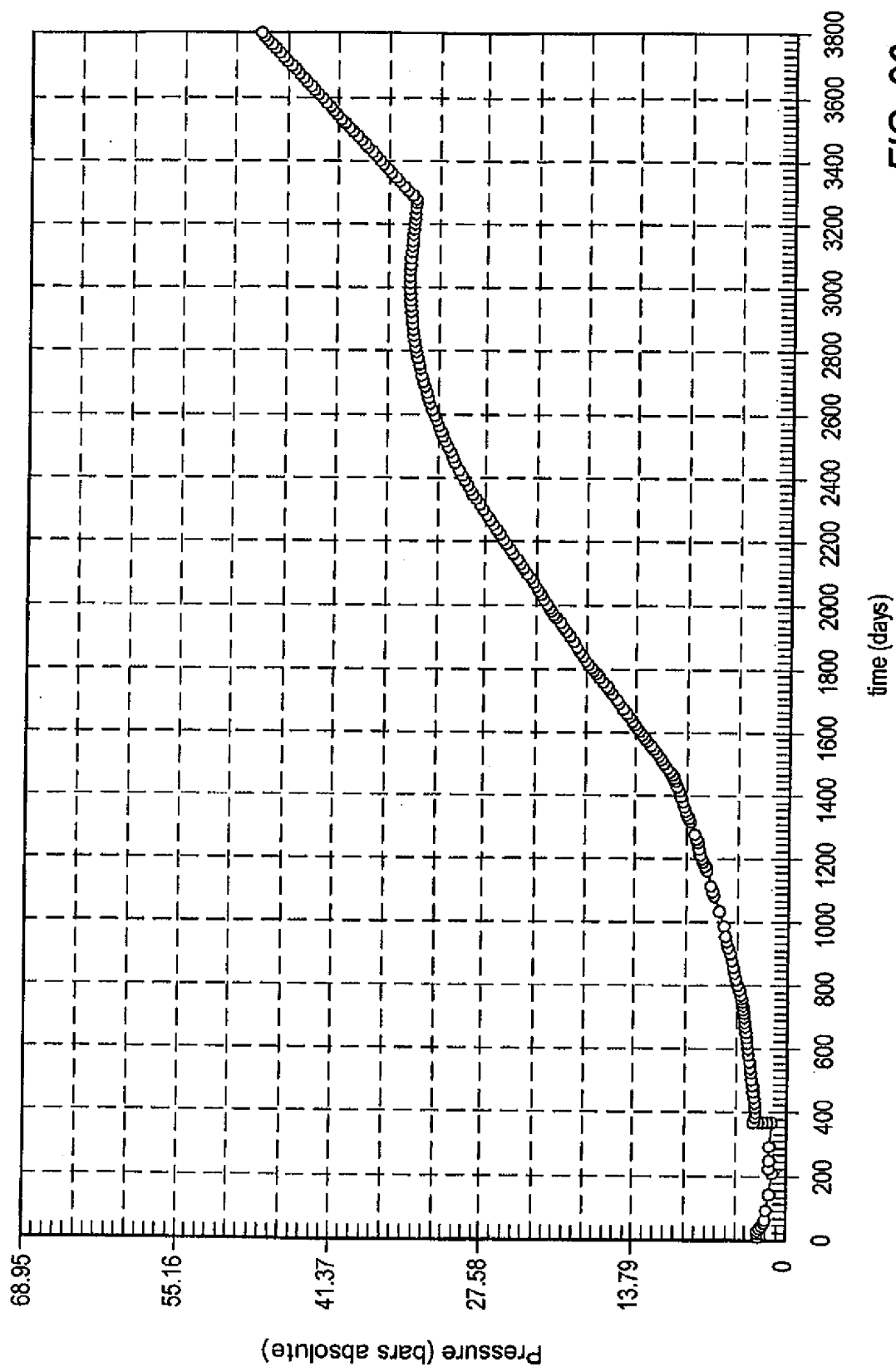


FIG. 26

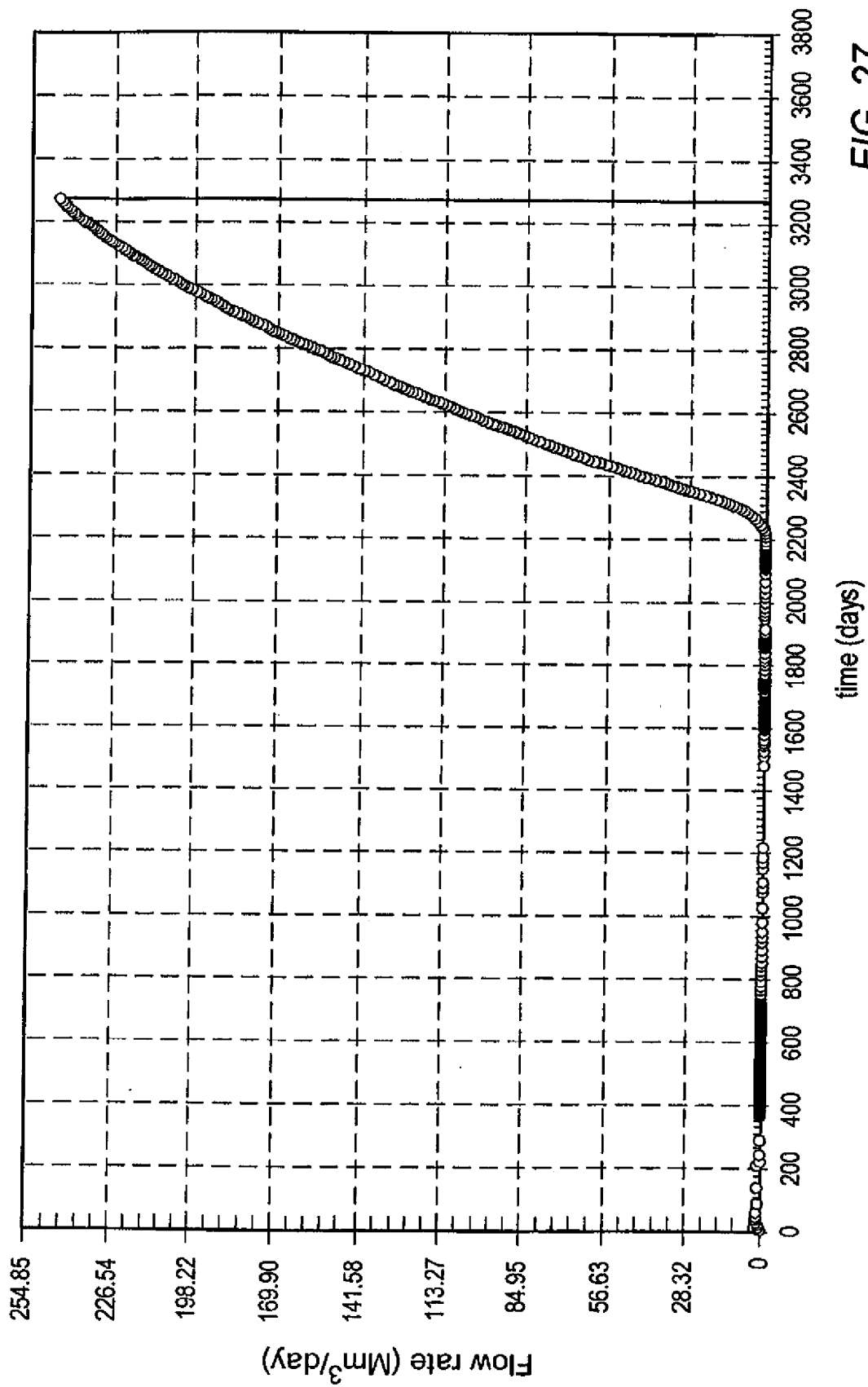


FIG. 27

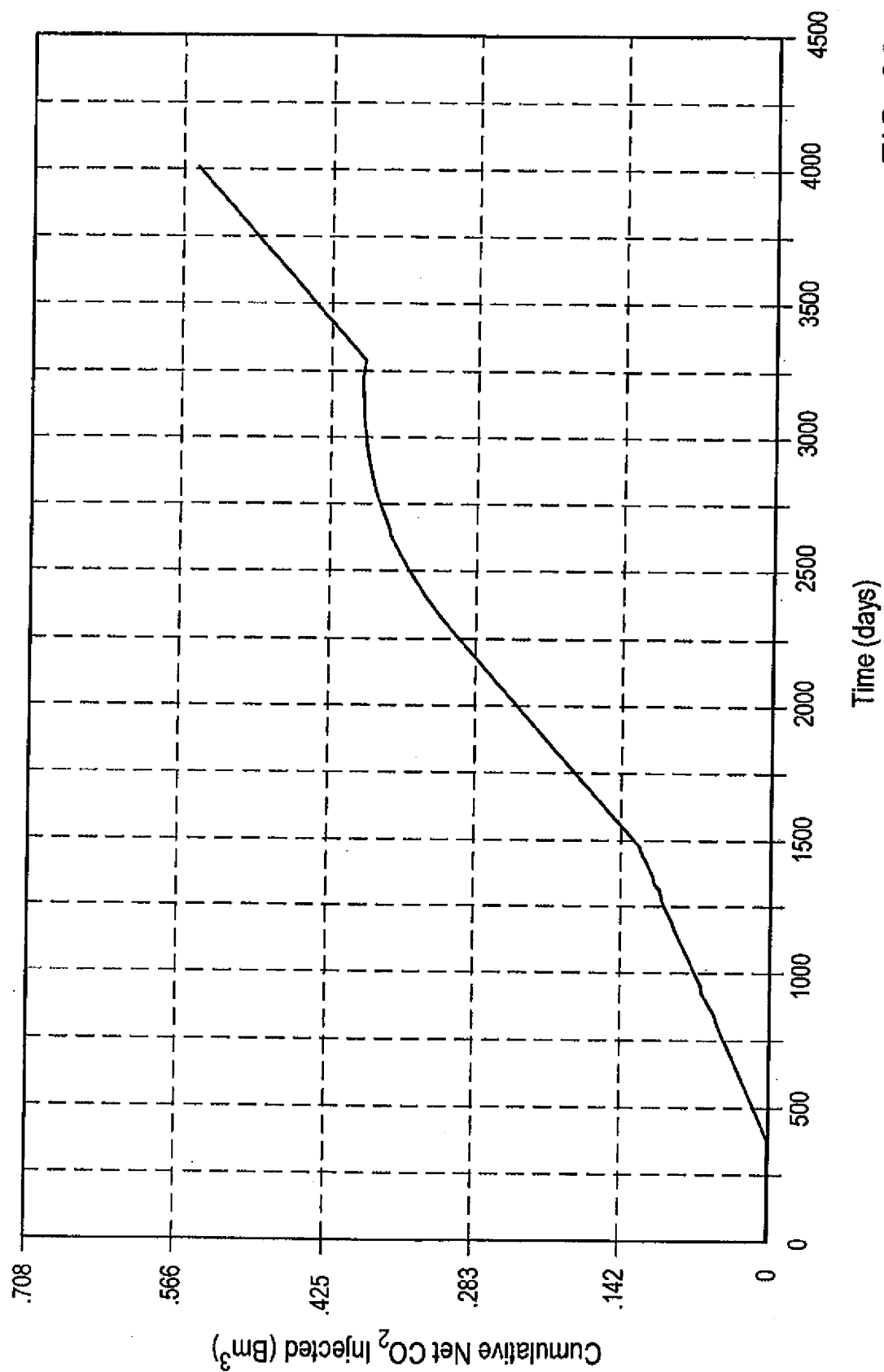


FIG. 28



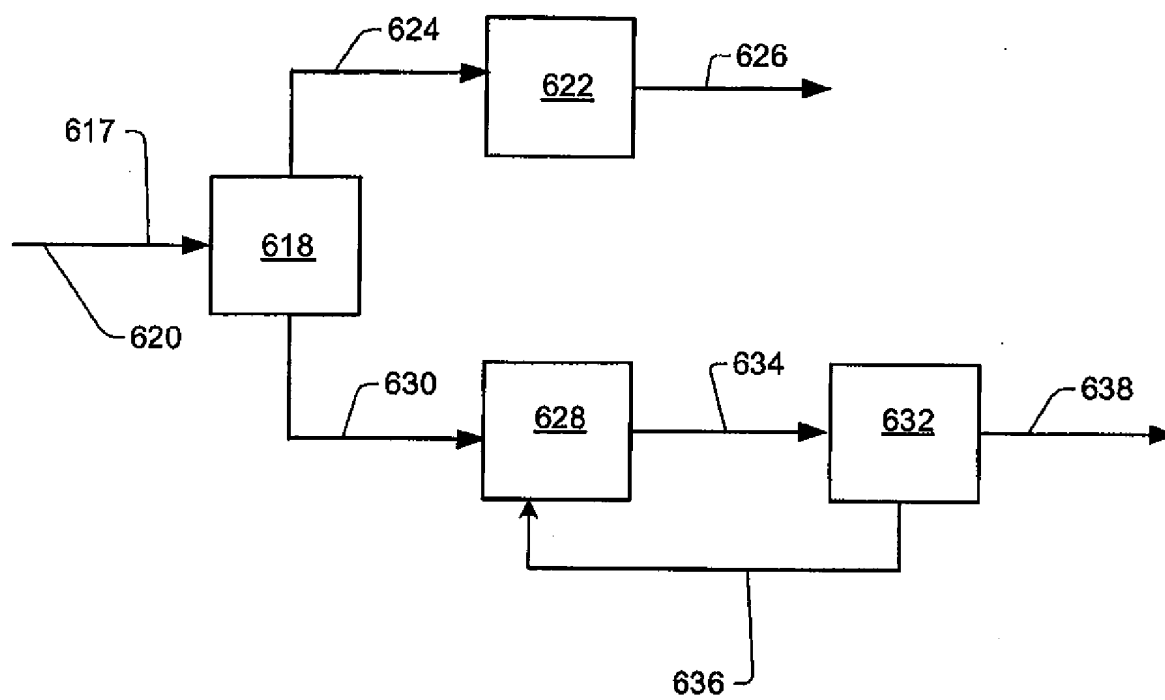


FIG. 29

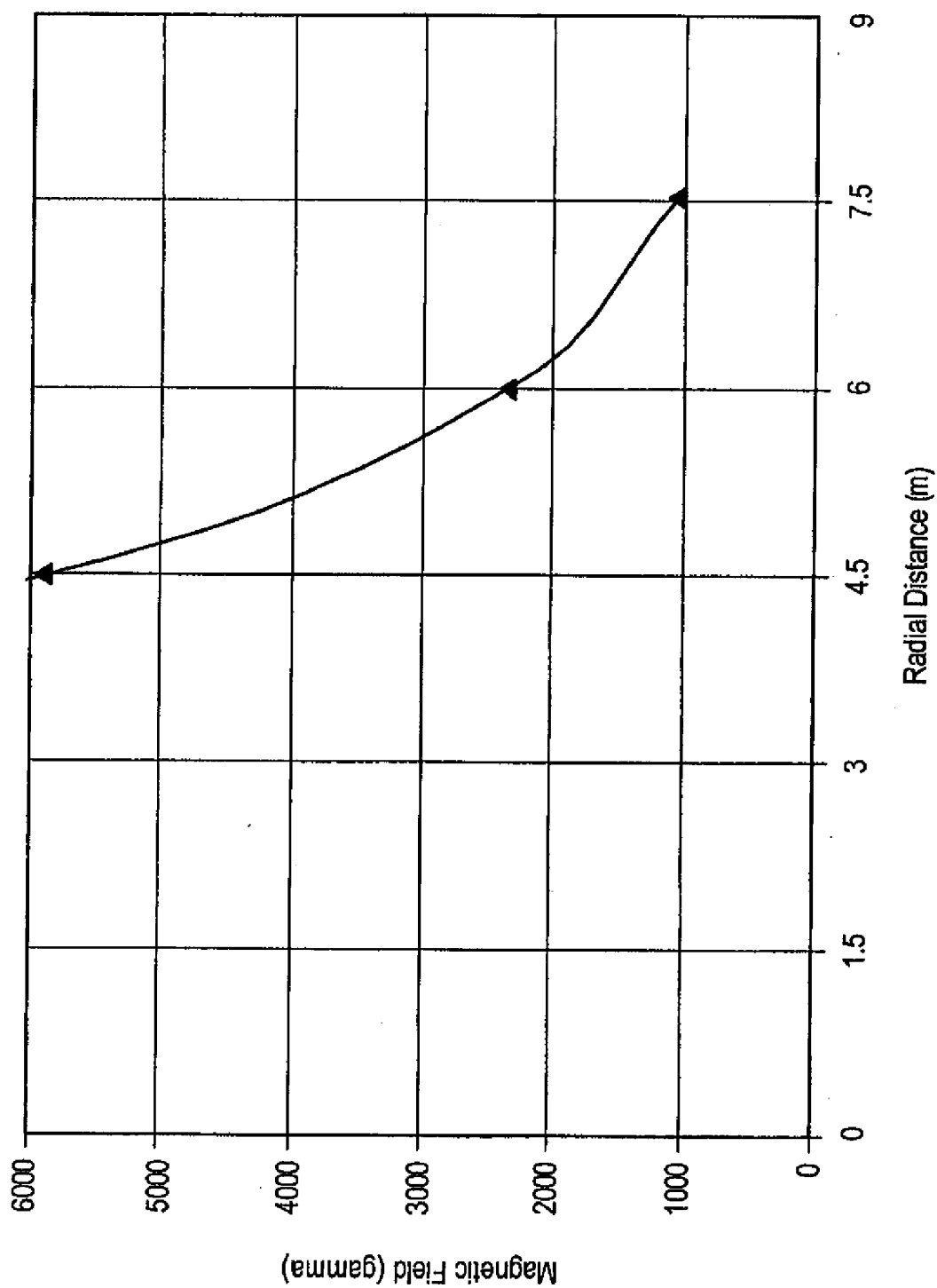


FIG. 30

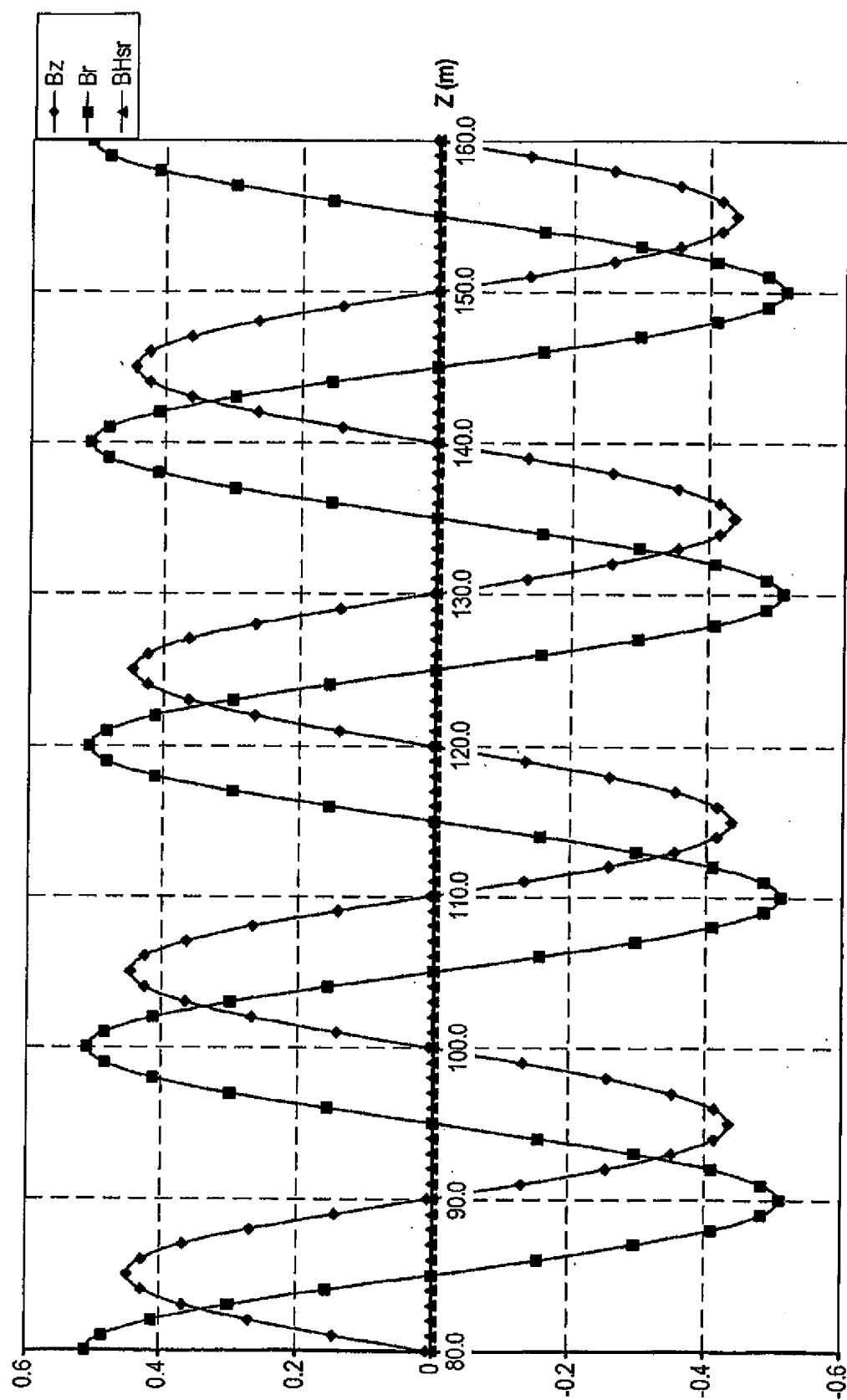


FIG. 31

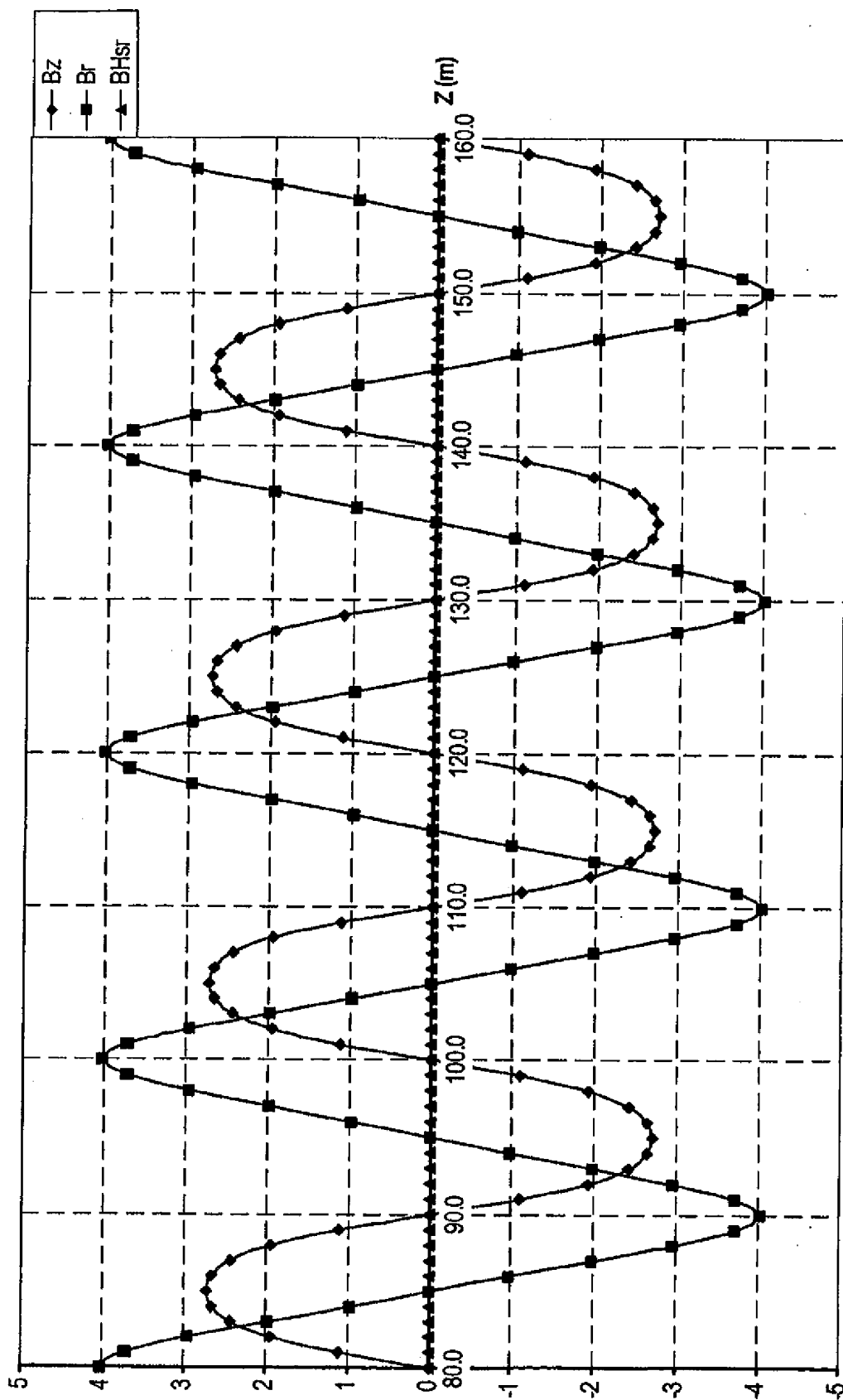


FIG. 32

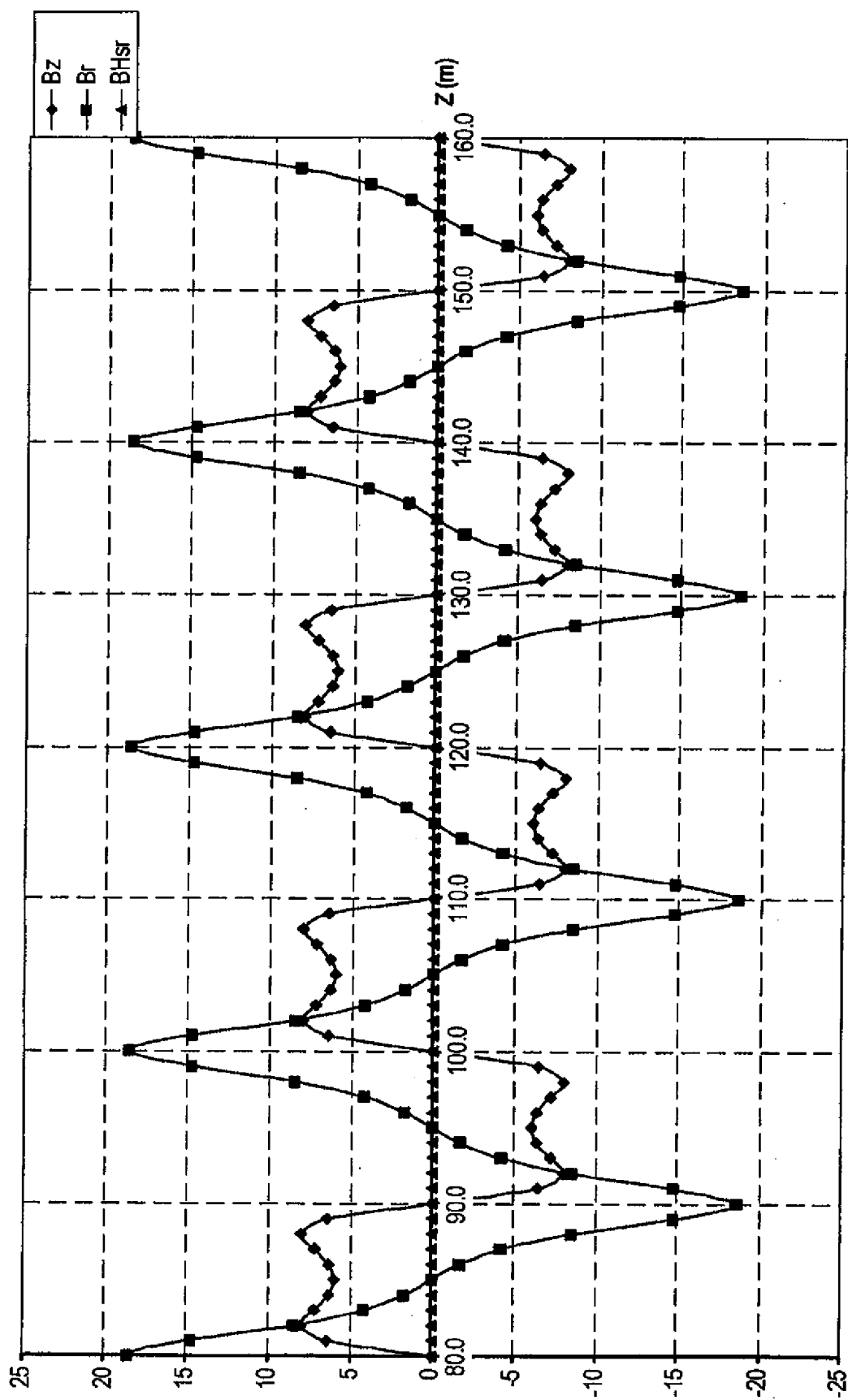


FIG. 33

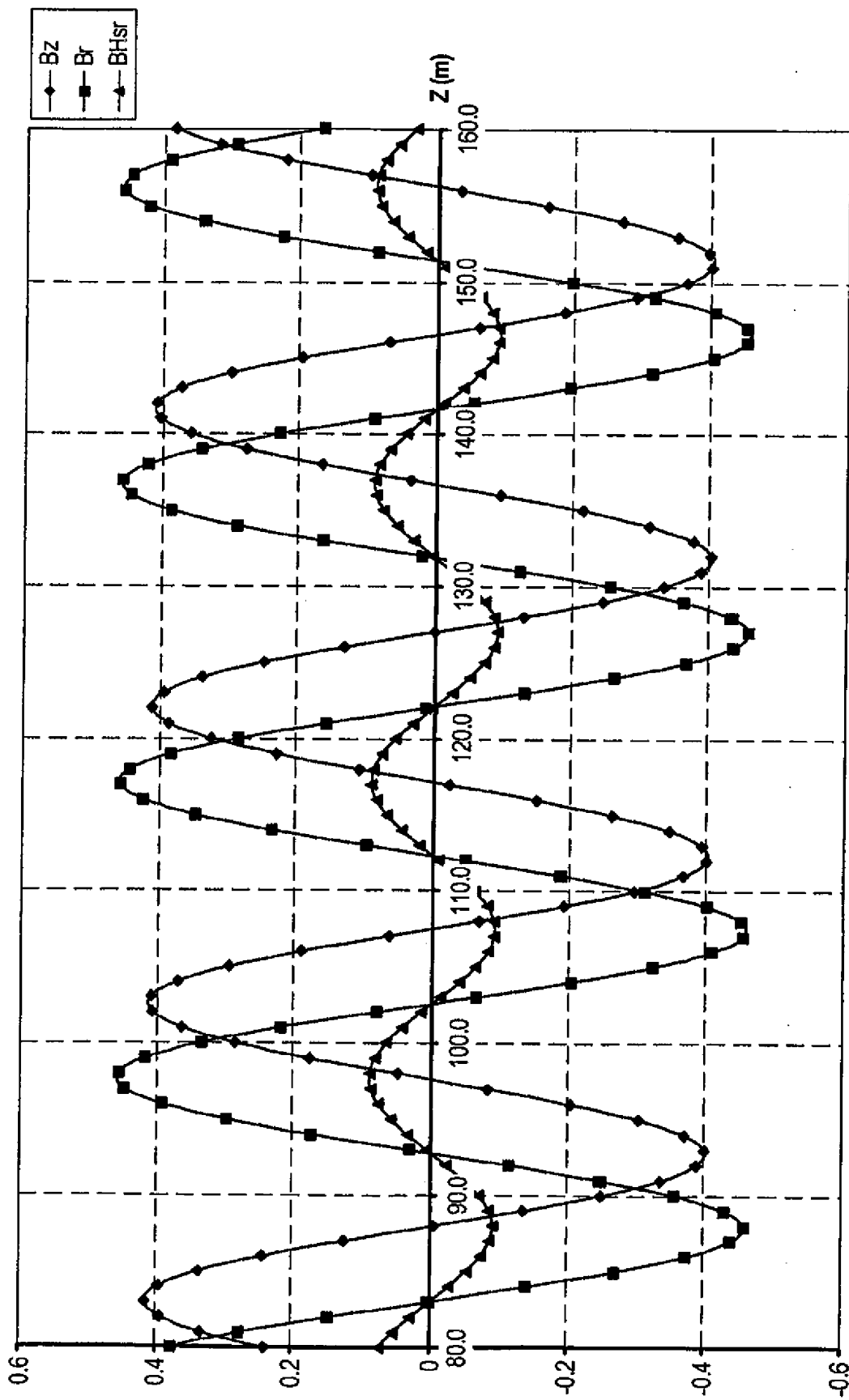


FIG. 34

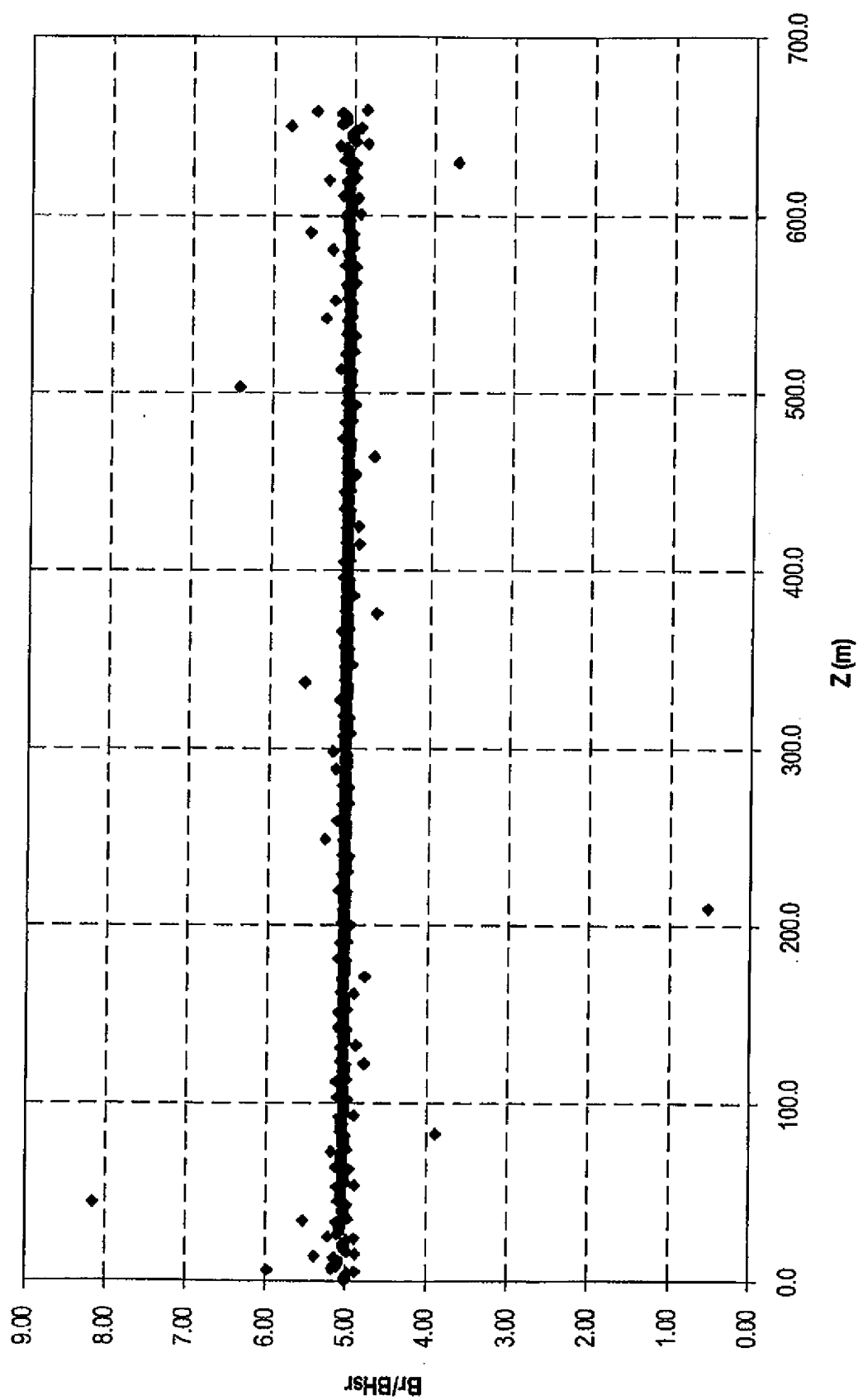


FIG. 35

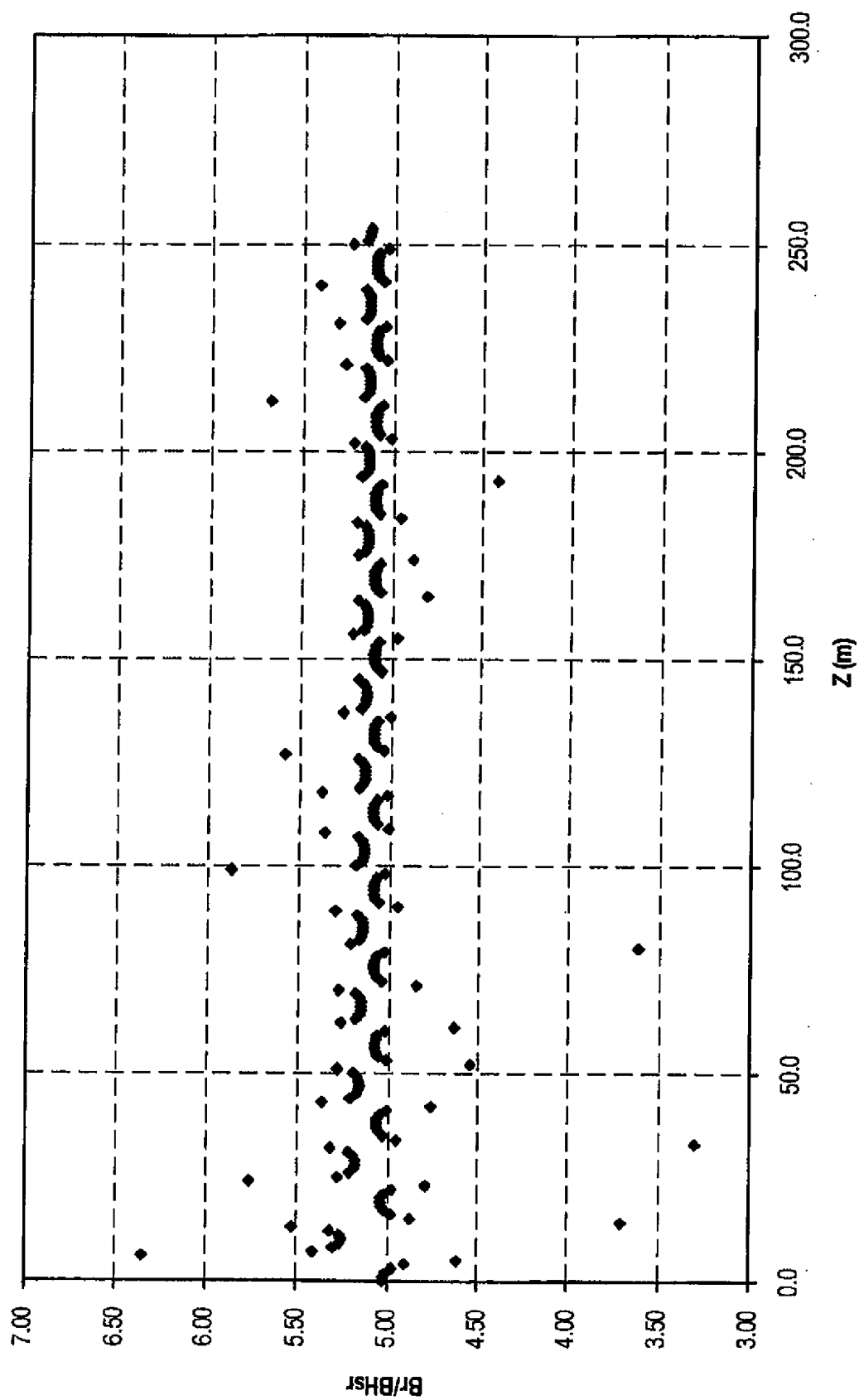


FIG. 36



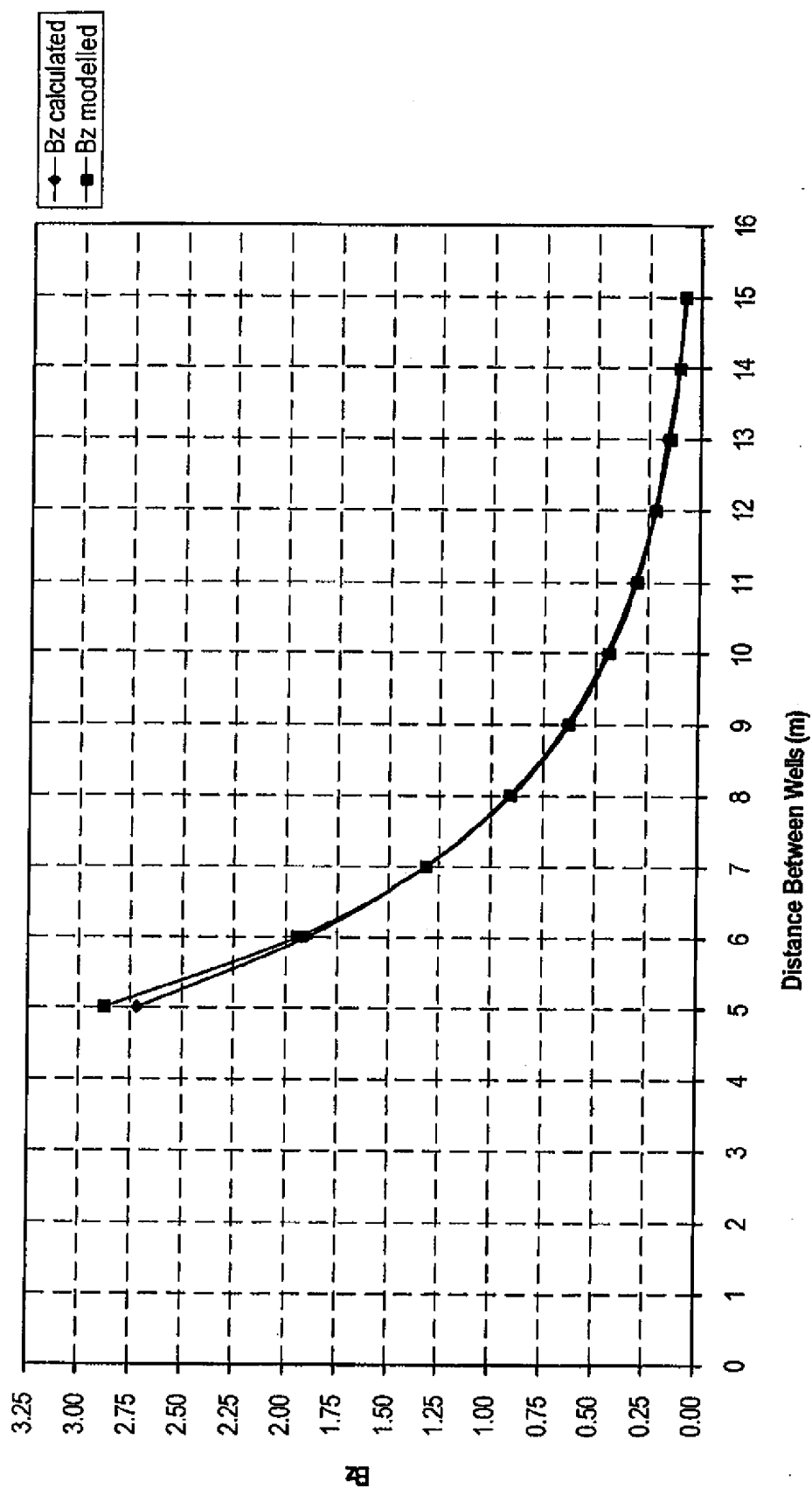


FIG. 37

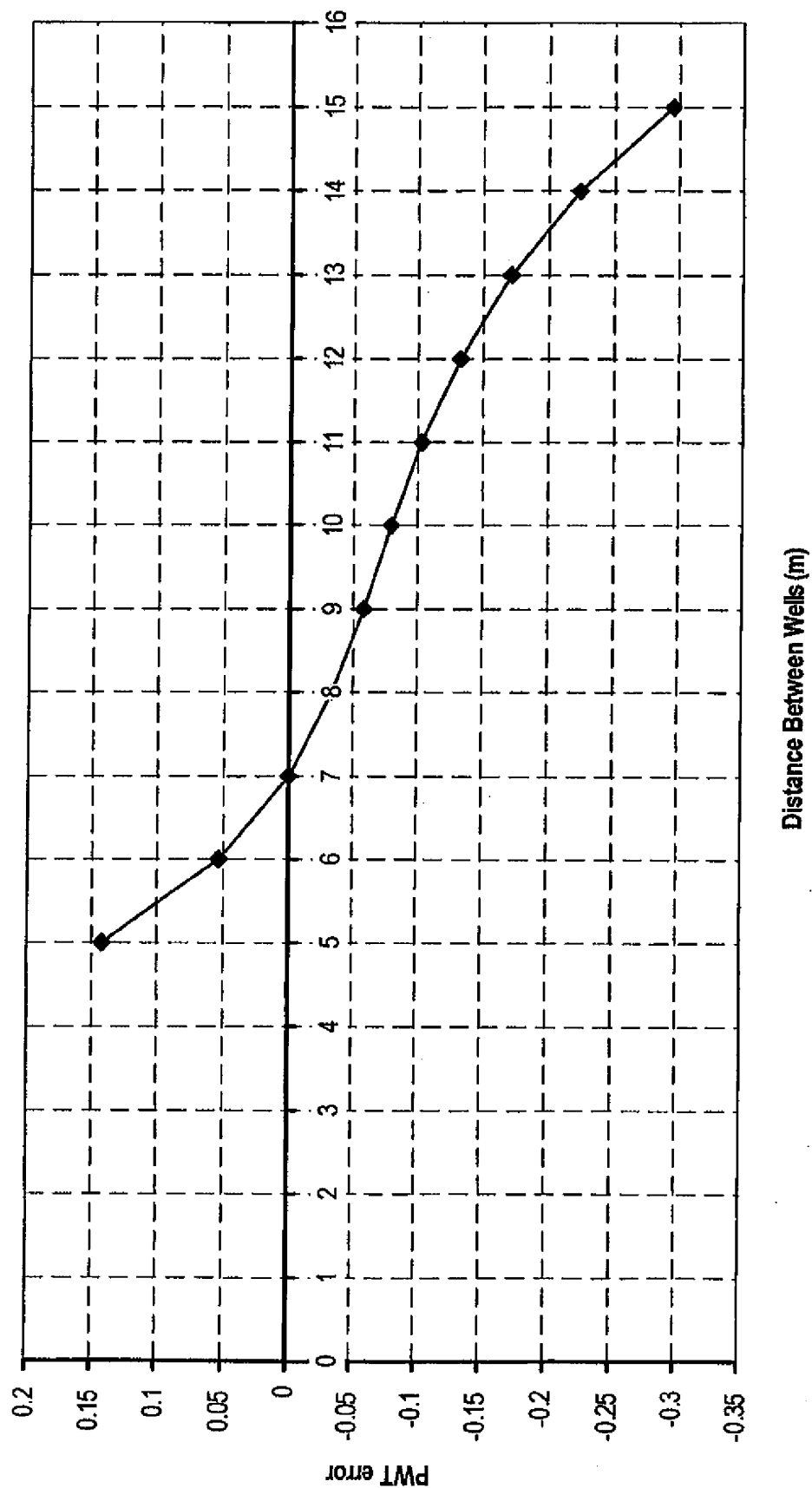


FIG. 38

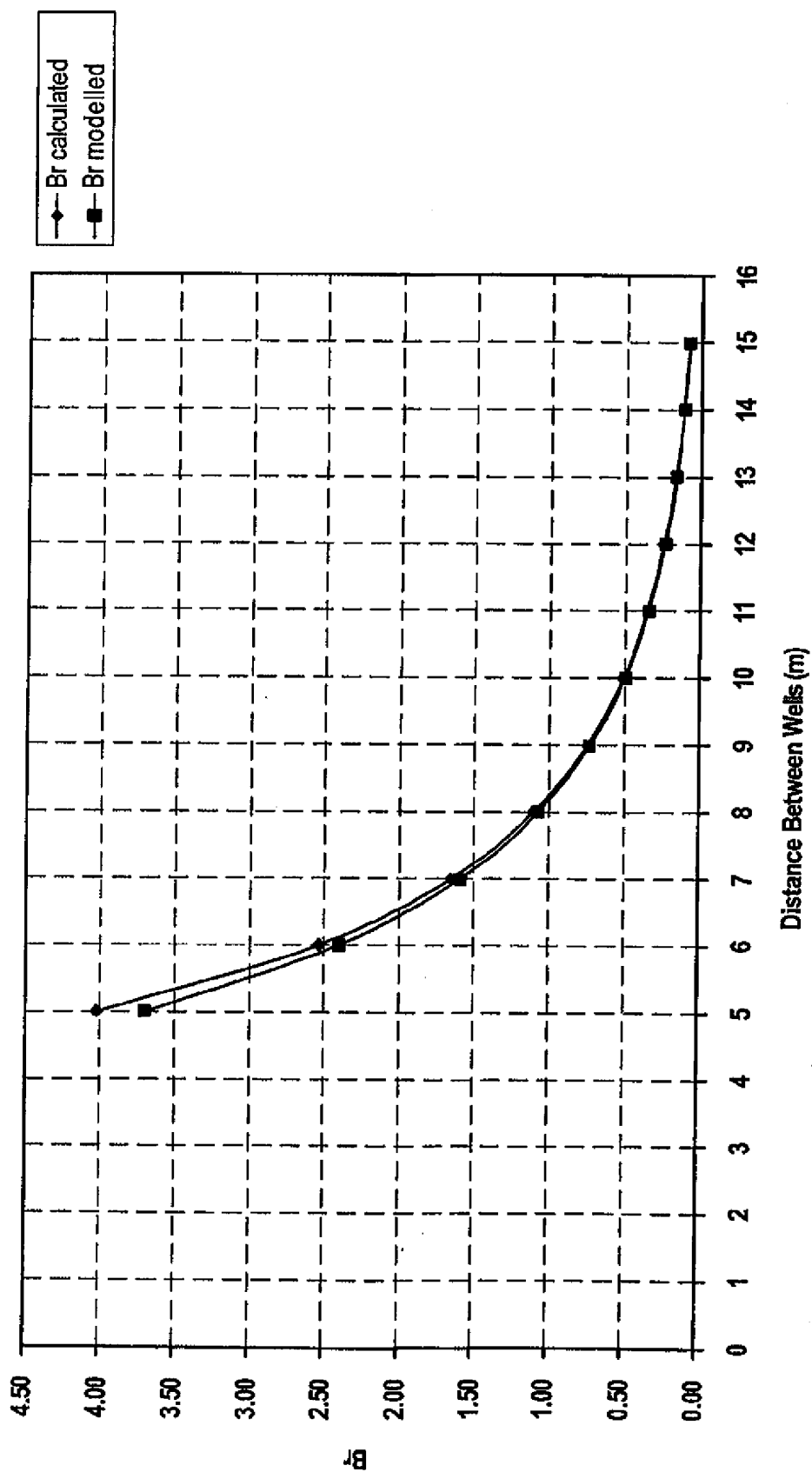


FIG. 39

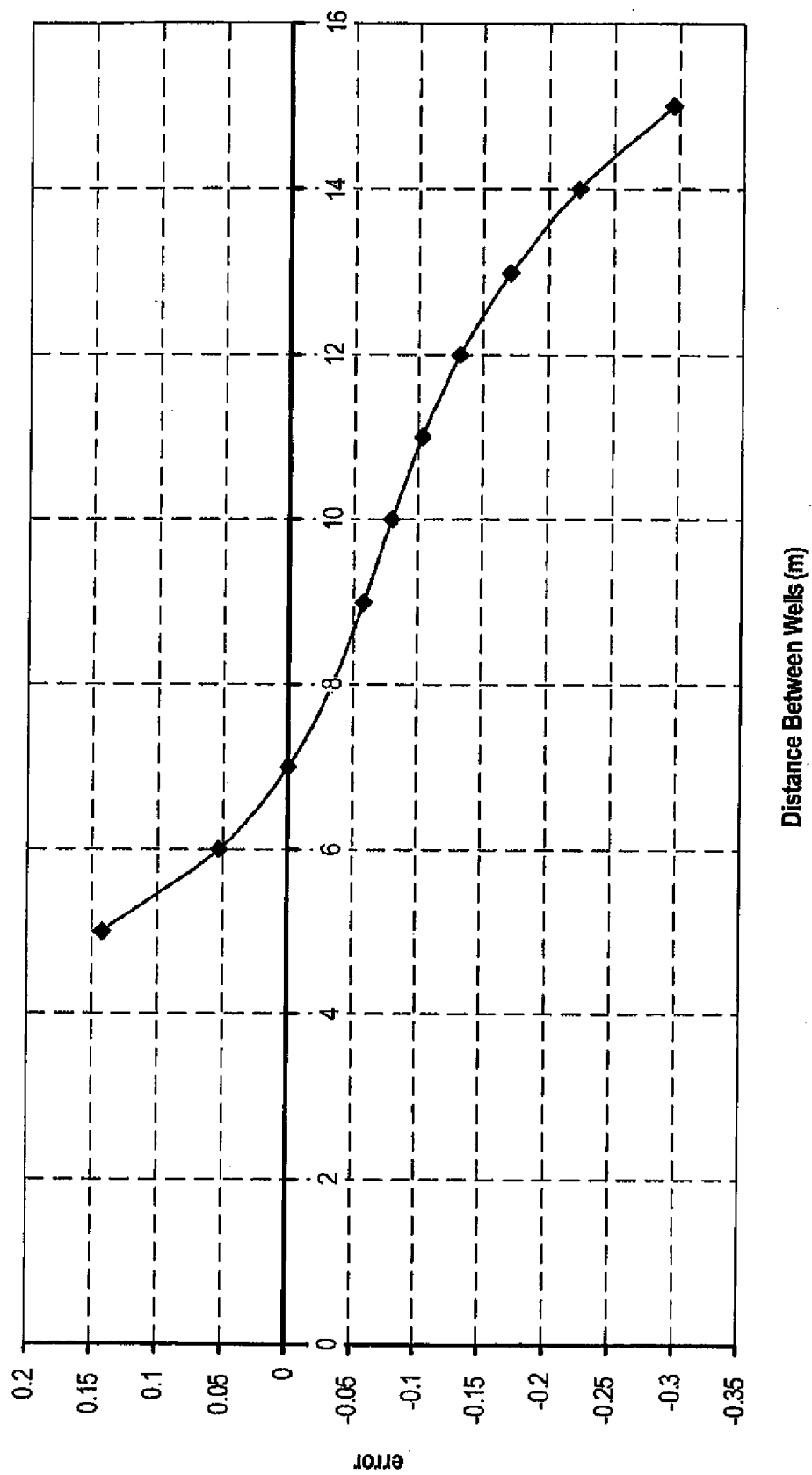


FIG. 40

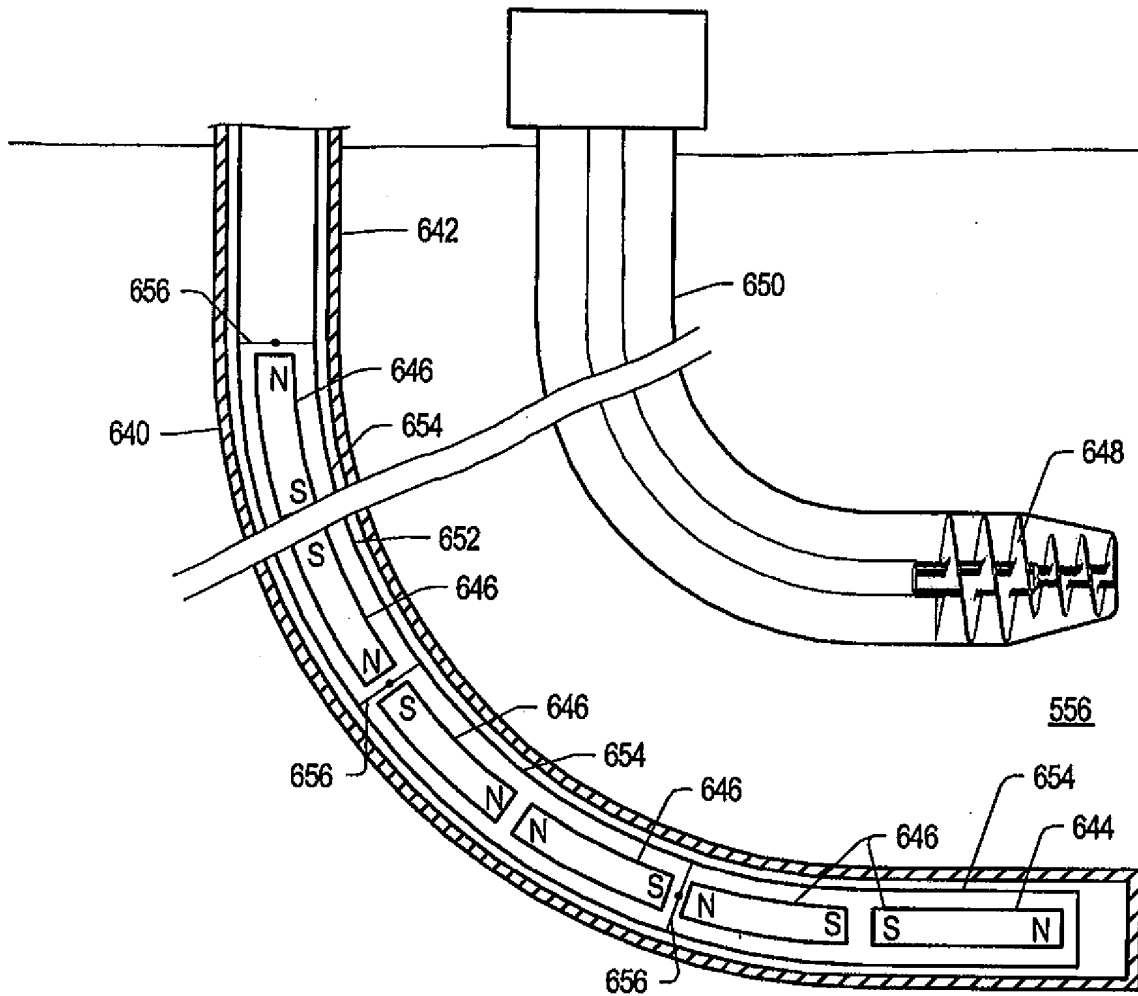


FIG. 41

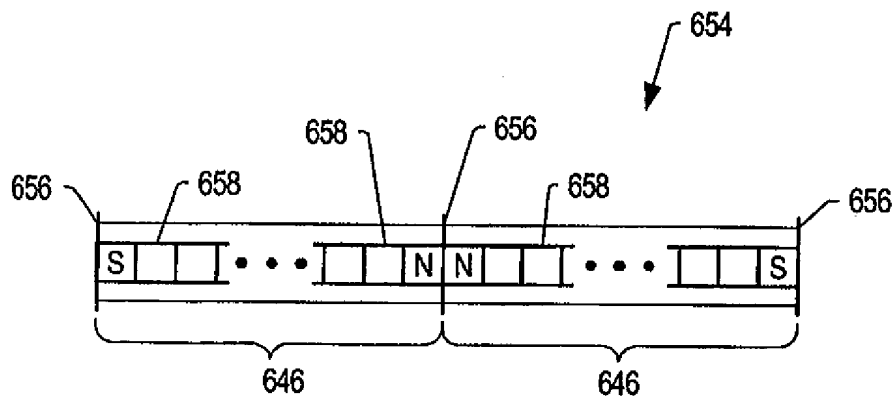


FIG. 42

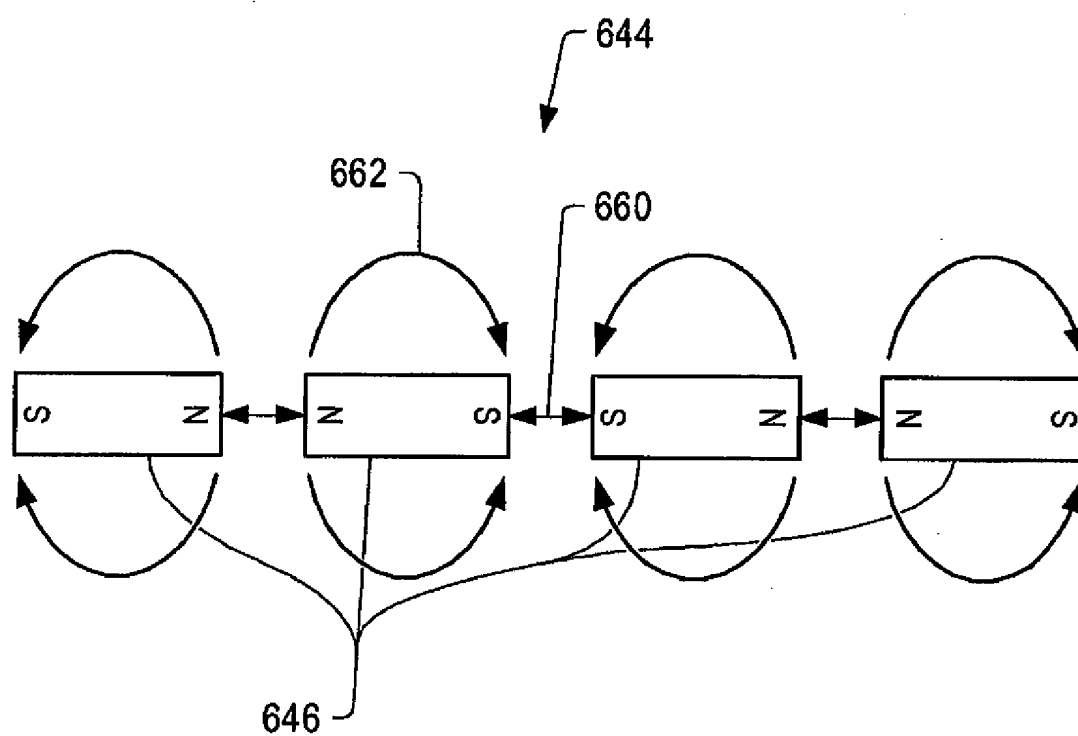


FIG. 43

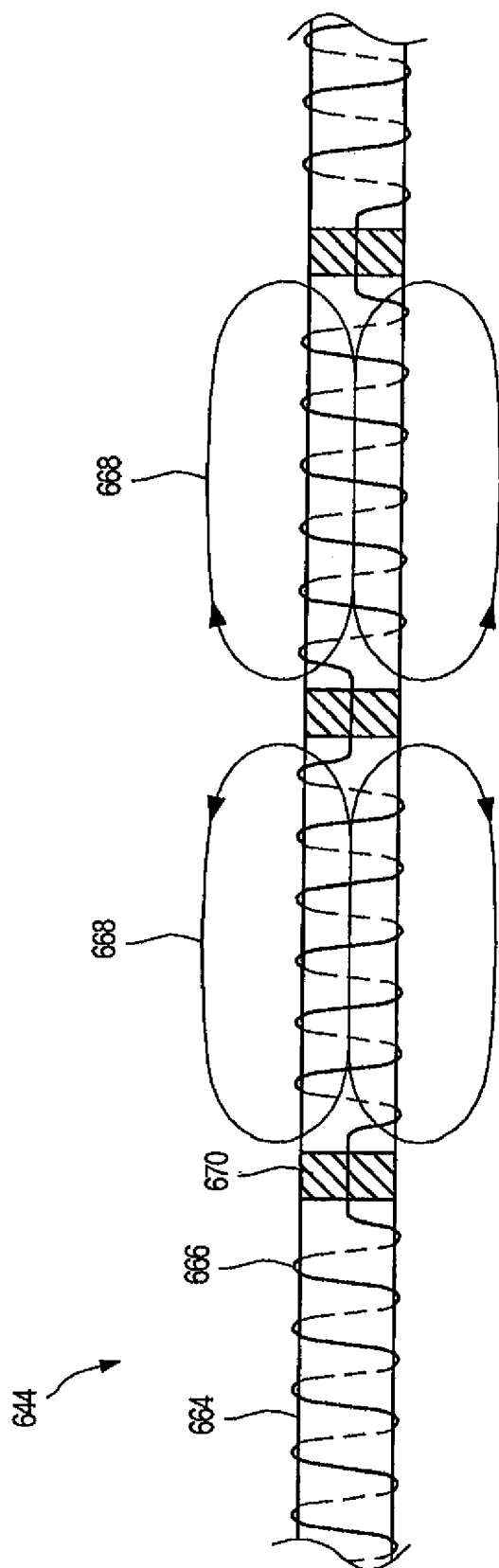


FIG. 44

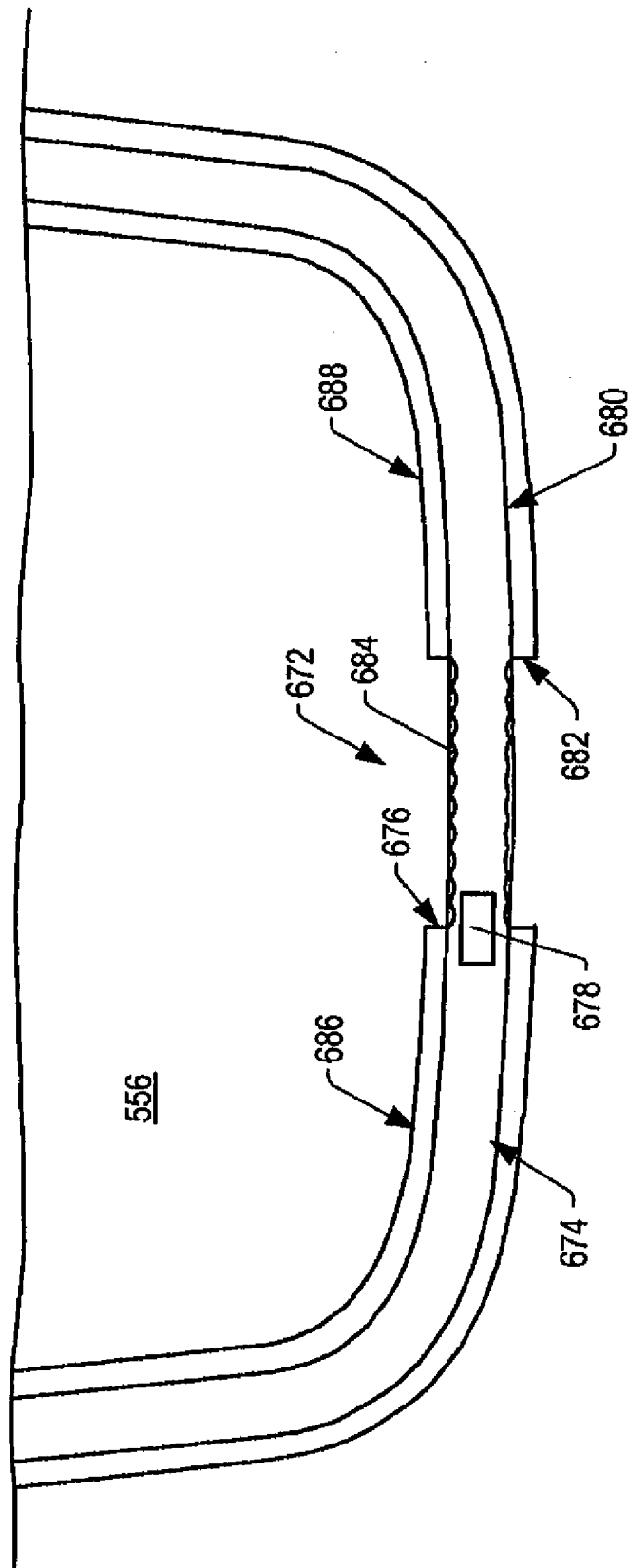
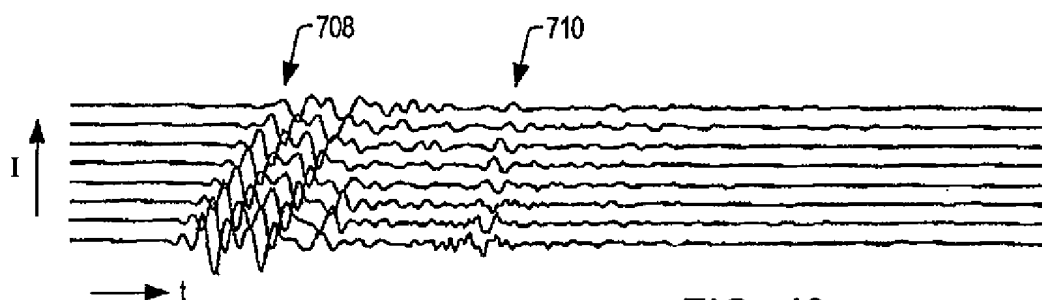
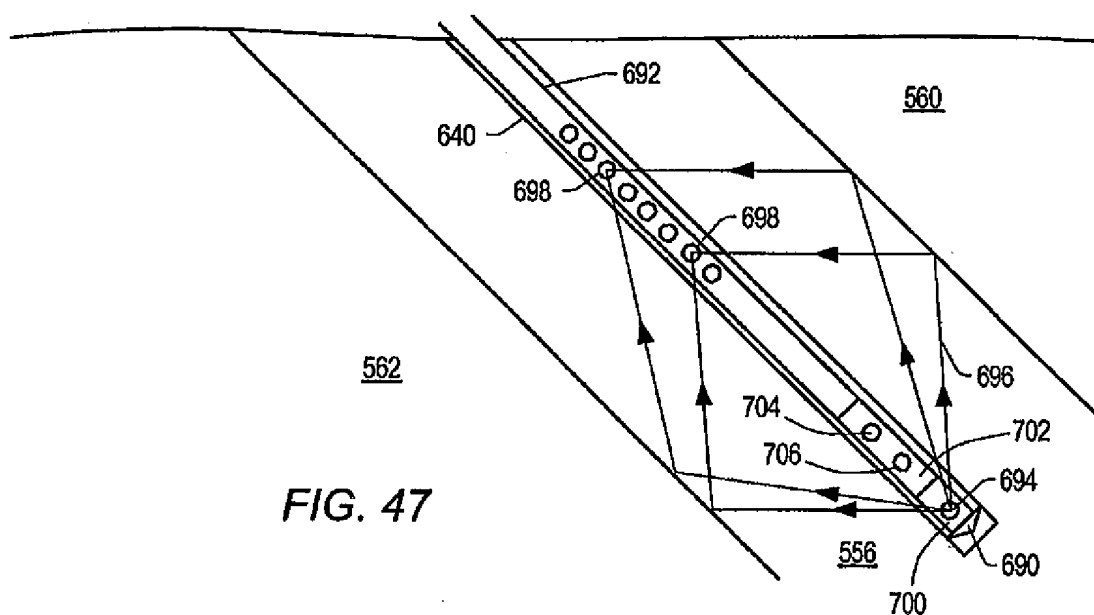
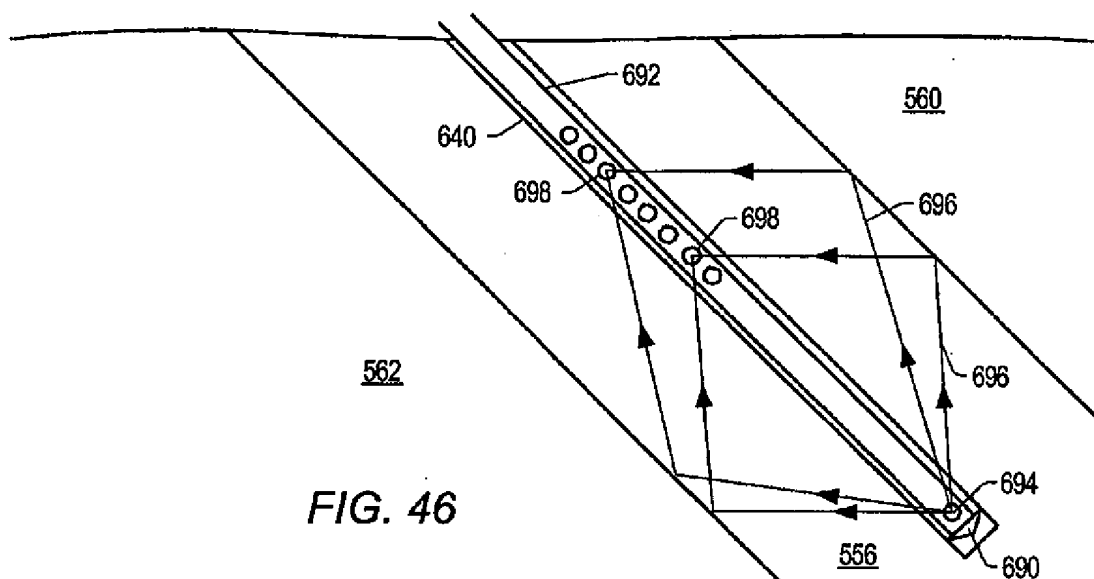


FIG. 45





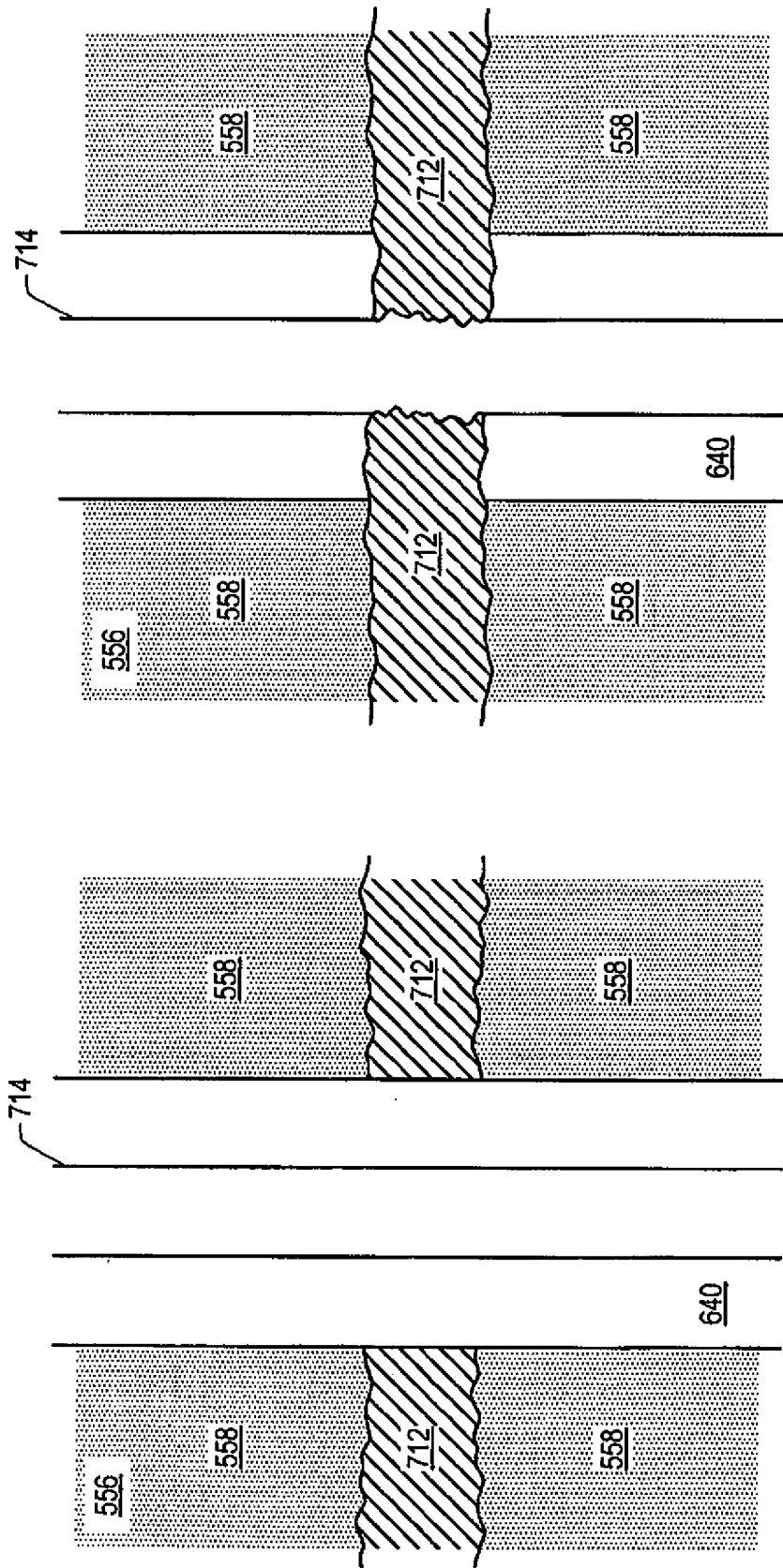


FIG. 49

FIG. 50

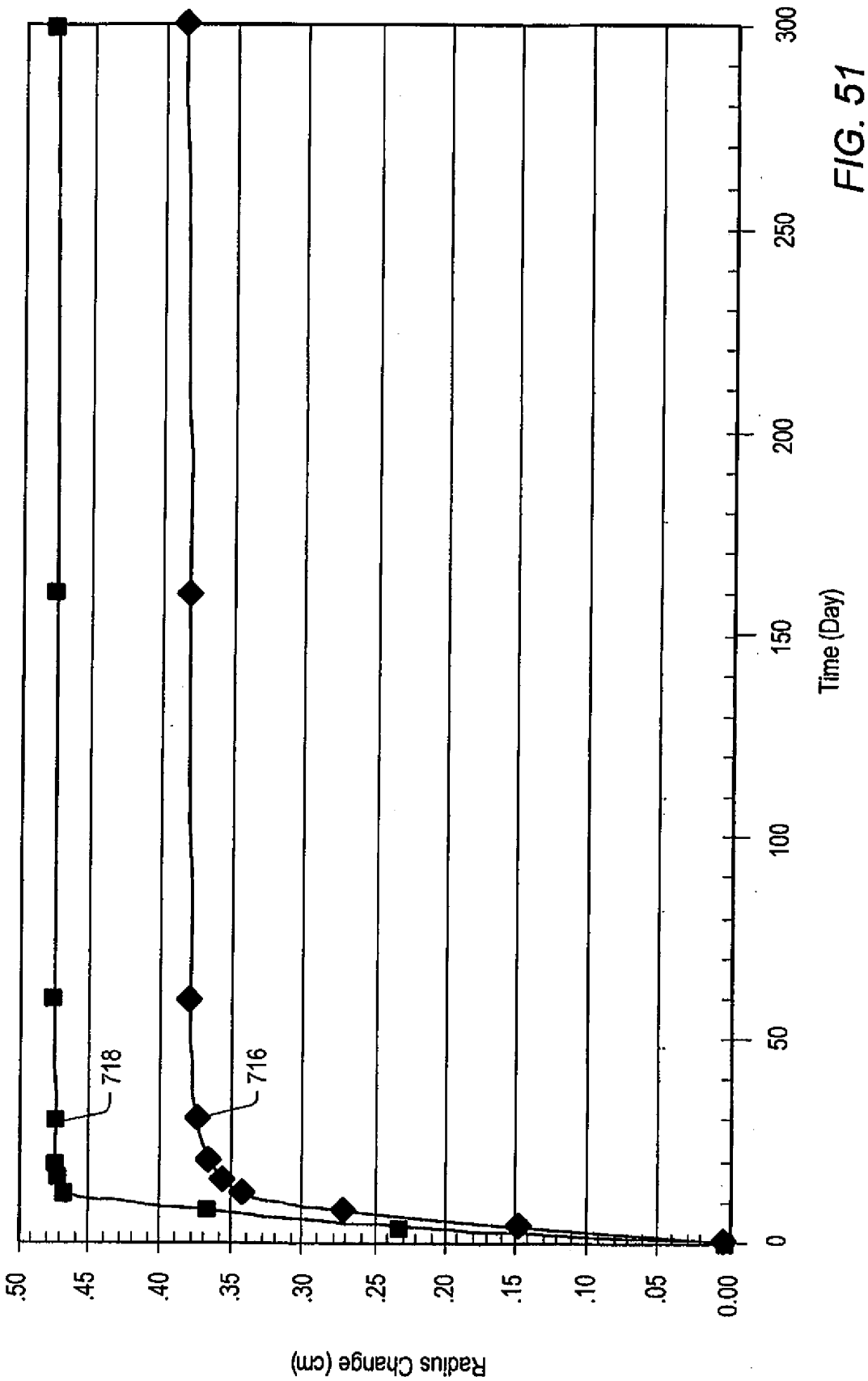


FIG. 51

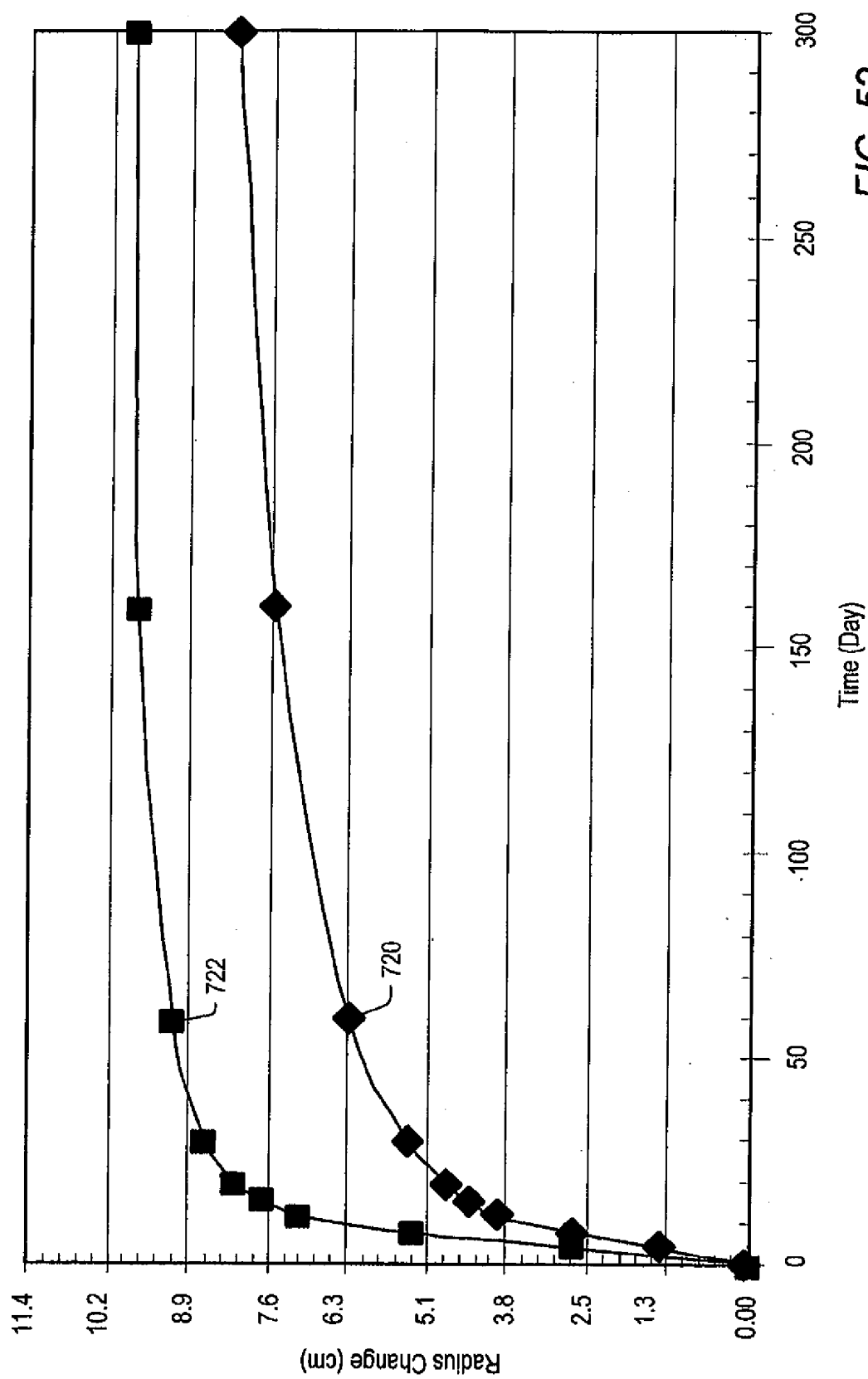


FIG. 52

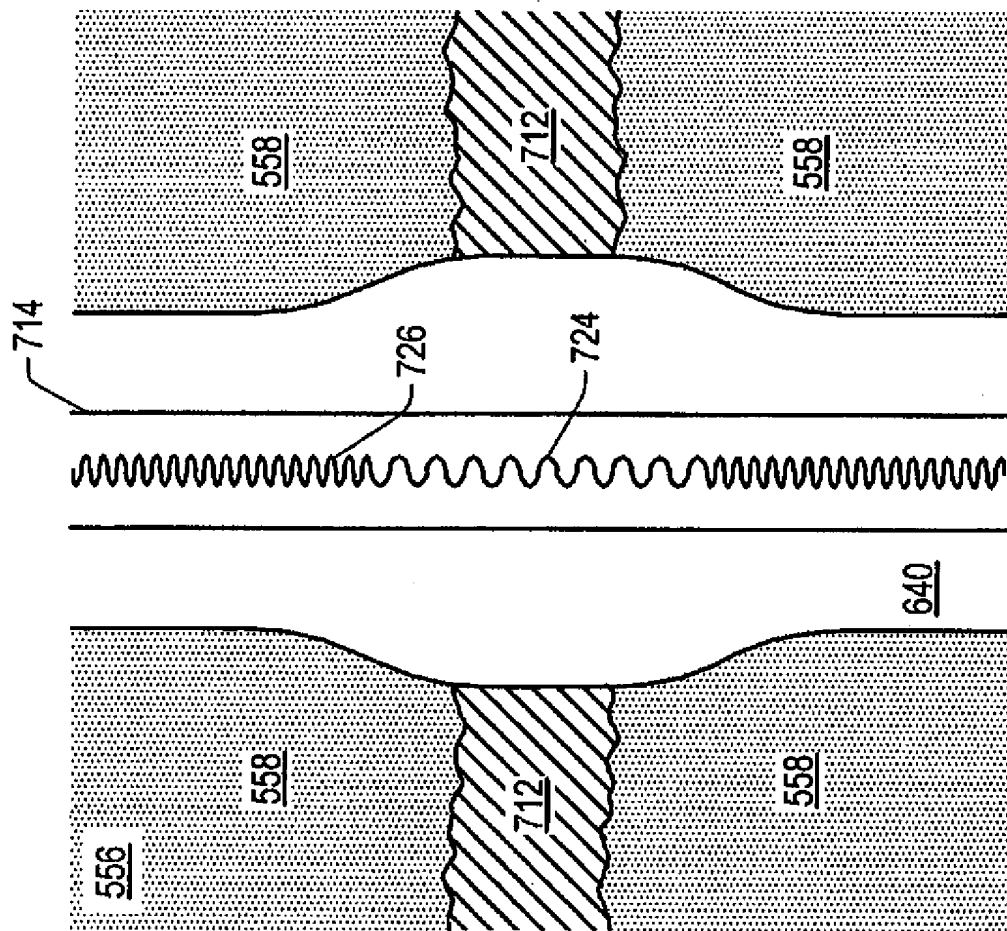


FIG. 53

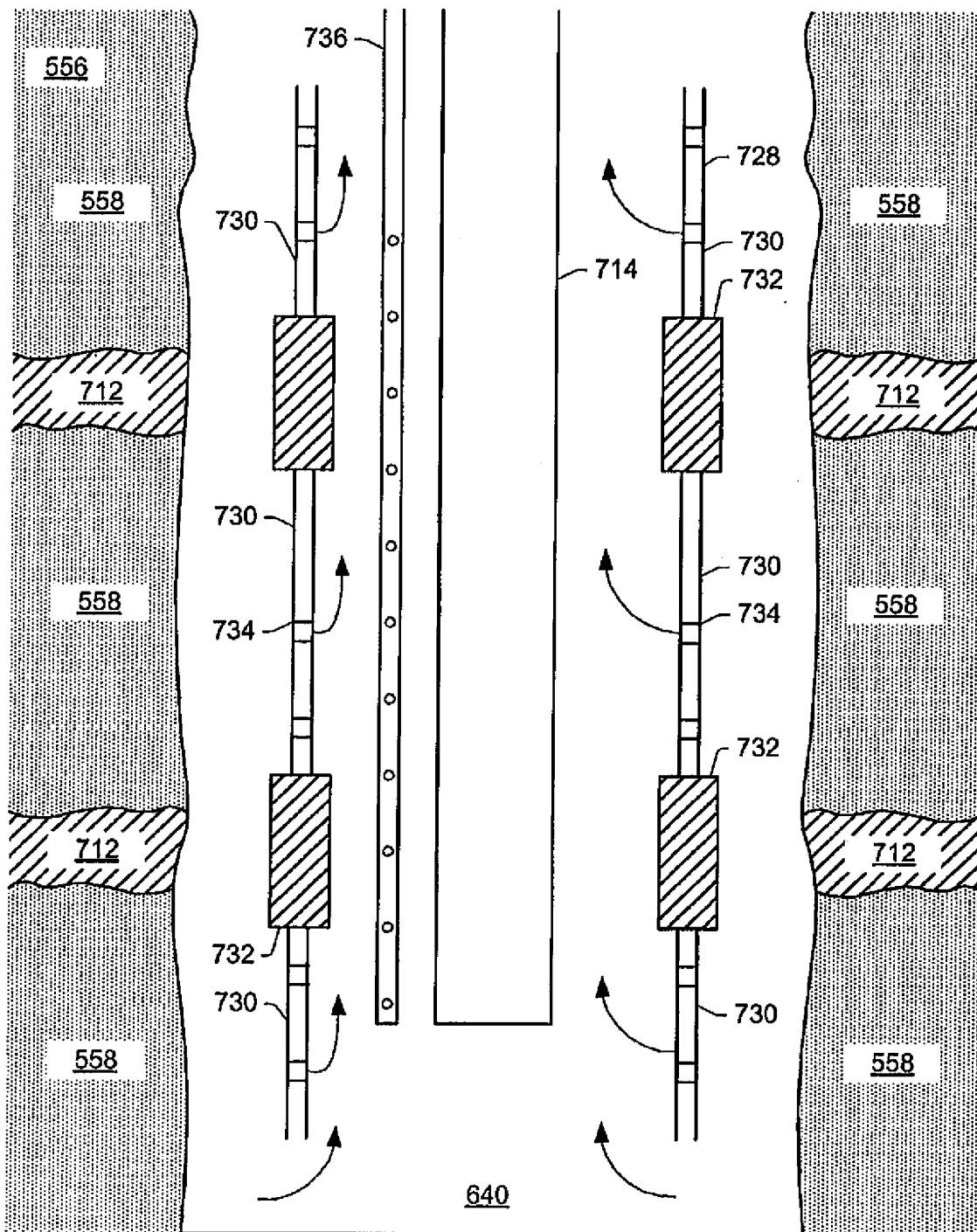


FIG. 54